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'*Knowledge is proud that he has learned so much,*
Wisdom is humble that he knows no more.'—COWPER.

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CONVERSATIONAL DRAWING LESSONS FOR INFANTS.

BY MRS. E. MORTIMER,

Author of Practical Kindergarten Lessons for English Infant Schools; Lecturer on the Kindergarten at the Home and Colonial Training College.

COMBINATION OF VERTICAL AND HORIZONTAL LINES.

HAVING taught the children to draw vertical and horizontal lines of three squares long, they should now have exercises with these lines combined. The exercises are commenced in the same way as the exercises with the separate lines. The children must draw a vertical line of one square and a horizontal line of one square, so as to form a right angle, further exercises following by placing the right angle in various positions. The next exercises consist of similar patterns, with lines of two squares followed by lines of three squares. By combining the different positions many other exercises are produced, thus giving a great variety of patterns for the children to copy.

A different set of exercises is formed by combining lines of different lengths—*e.g.*, vertical lines of two squares with horizontal lines of one square, and so on.

Lesson. To draw a right angle with vertical and horizontal lines one square long.

The teacher to have a chequered blackboard and the children to have slates similarly ruled.

Question the children on the different kinds of lines previously used. Require them to draw a vertical line, then a horizontal one. The teacher should now draw a vertical line of one square, and from the bottom of this draw a horizontal line of similar length. The children should do the same on their slates. On the teacher asking the children what the two lines together make, they would probably answer the letter L. Yes, it is something like it. Can you place two fingers like those two lines? Can you see any lines in the room like them? What do we call the place where those two lines meet?—teacher pointing to the two walls of the room—A corner. Can you show me a corner of your slates? That is right. How many corners has your slate? Now can you see any corners *on* your slates? Yes, the little squares have corners. How many corners has each little square? Now look at the corner you have made, and make another by the side of it. How did you make the corner? By drawing two lines. What kind of lines? Now look; where am I putting the chalk? By the corner. Yes, and we call this space an angle. Each of you point to the angle you have made. How many angles have you made? Make two more angles on your slates. Now make an angle with two fingers. Tell me where there are some angles in the room. Now make two more angles on your slates. What kind of lines do you draw to make the angle?

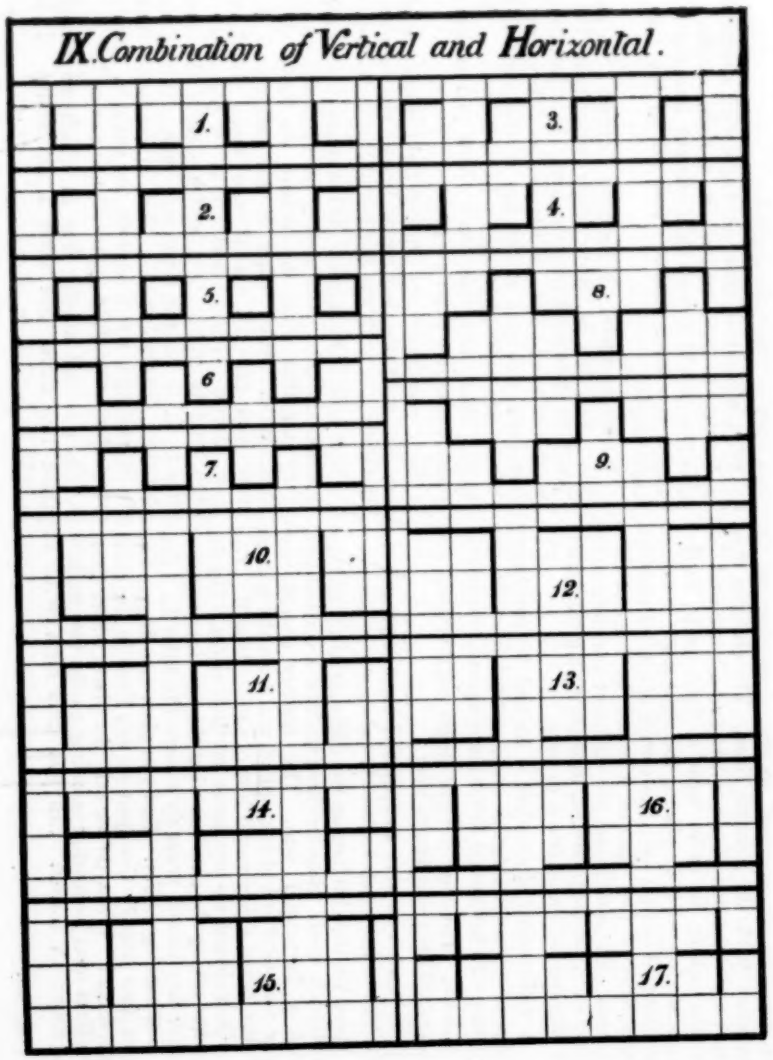
Well, when you make an angle with a vertical and a horizontal line, we call it a right angle. The children should repeat this. Count how many right angles you have made. Now fill up the line with right angles.

Watch me again. What have I drawn? A vertical line. Yes, that is right. Now what have I done? You have drawn a horizontal line. Is it just the same as the others? No. What is the difference? Did you draw this one at the top of the vertical line? Where was the other one? At the bottom. What have I made with this one? Now you make some right angles like this one. ⌐

Now you have two lines of right angles finished; one line with the horizontal line at the bottom, and the other line with the horizontal line at the top.

Now look at me again. What have I drawn? A horizontal line. And now? A vertical line. Are they together like the others we have drawn? Not quite. Well what is the difference? I am sure you can tell me if you try. Well, what is it, Mary? The vertical line is on the other side. Yes, that is right. On which side is the vertical line? It is on the right side now. Where was it before? On the left side. Yes, in the angles we have been making it was always on the left side. Now you may draw some right angles like this one. ¬

There is still another way in which we can place these two lines. See what I am doing. I have


IX. Combination of Vertical and Horizontal.
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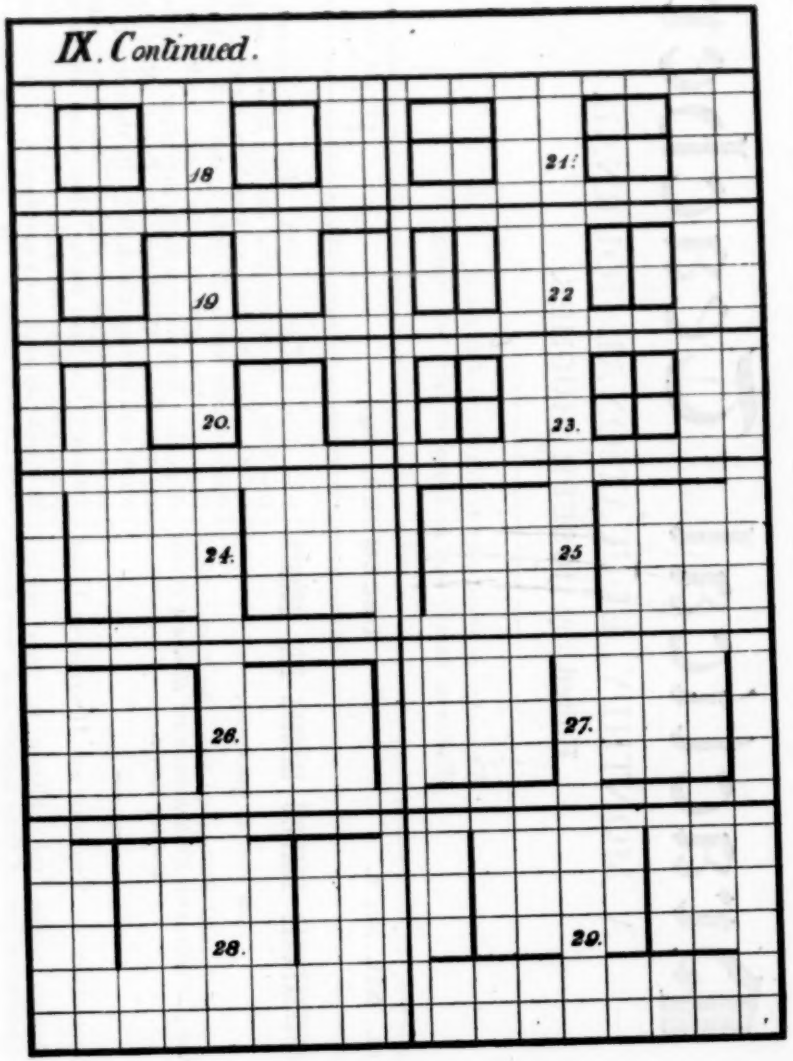
IX. Continued.
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28.
29.

drawn a horizontal and a vertical line. Where is the horizontal line? Now you may draw some right angles like this one. ⌟

Would you like to put all these four angles together? Well, you may do it as I do. The teacher then drawing the four angles in the same order as they have been taught, calling the children's attention to each one, would form a large square.

Well, what shape have we now? A square. Yes, a large square. Which would you call small squares? Yes, those ruled on your slates. How many of the small squares are there in the large one?

(To be continued.)

—o—

SPECIMEN NOTE, TIME, AND EAR TESTS FOR THE CODE EXAMINATION.

BY W. G. MCNAUGHT,

Associate of the Royal Academy of Music.

DIVISION II.—STANDARDS I. AND II.

TIME TEST.

Tonic Sol-fa.—2. To sing on one tone to the syllable 'laa' an exercise including one-pulse and two-pulse tones, in two-pulse or four-pulse measure.

Staff Notation.—2. To sing on one sound to the syllable 'laa' an exercise in $\frac{2}{4}$ or $\frac{4}{4}$ time, which shall include minims and crotchets.

PRELIMINARY TESTS.

The amount of knowledge of time facts and their notation looked for in this Division is so slight it is hardly possible in the Tonic Sol-fa notation at least to devise easier *written* tests than those prescribed in the requirements. The most useful preliminary tests are those that require regular and well accented performance of rhythmic phrases imitated from a careful pattern or dictated by the teacher, say as follows:—

Sing four two-pulse tones and four one-pulse tones
one four-pulse tone and eight one-pulse tones.

STANDARD TESTS.

Tonic Sol-fa Notation.

Two-Pulse Measure.

The letter 'd' is preferable to 'l,' not only because it is more easily read, and not confused with the upright bars, as 'l' often is, but because it can be uttered far more distinctly than 'l.'

(67)

d : d	d :—	d : d	d :—
d :—	d :—	d : d	d :—

(68)

d :—	d :—	d : d	d :—	d : d
d : d	d : d	d :—		

(69)

d : d	d : d	d :—	d :—
d :—	d : d	d : d	d :—

FOUR-PULSE MEASURE.

Be careful to secure the medium accent on the third pulse of each measure. As a rule it is enough to take care that the strong pulse is a little more accented than the others. The feeling for duple accent being once roused, the medium pulse will generally be naturally given.

(70)

d :—	d :—	d : d	d : d
d :—	d : d	d : d	d :—

(71)

d :—	d : d	d :—	d :—
d : d	d : d	d :—	d :—

(72)

d :—	d :—	d :—	d :—
d : d	d : d	d :—	d :—

Staff Notation.

The children have to be made acquainted with two signs for the beat or pulse, viz., the crotchet and the minim. The minim, therefore, will sometimes stand for two beats (*e.g.*, in crotchet time), and sometimes for one beat (*e.g.*, in minim time). The crotchet will sometimes stand for a whole beat or pulse (*e.g.*, in crotchet time), and sometimes for half a beat or pulse (*e.g.*, in minim time). Half-pulses are not required in crotchet time.

TESTS IN $\frac{2}{2}$ TIME.

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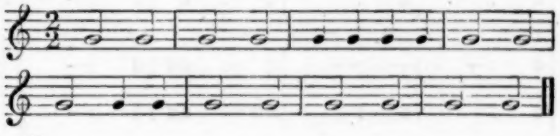

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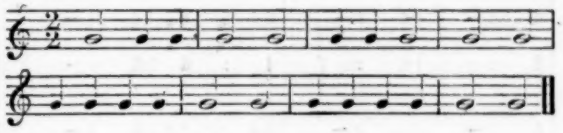
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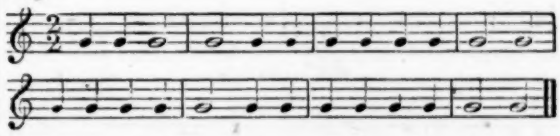
TESTS IN $\frac{4}{4}$ OR COMMON TIME.

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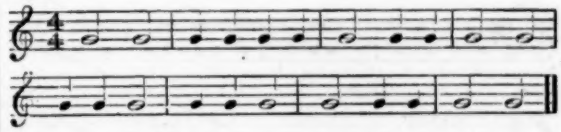
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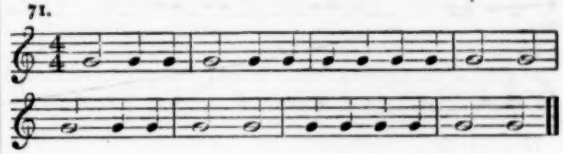
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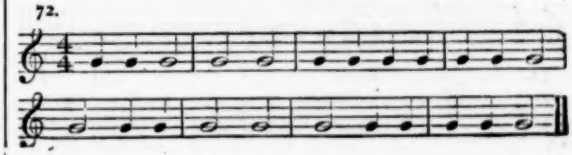

Beyond the Code.

These are specially adapted for Standard II. when taught separately from Standard I. The points introduced in advance of the code are :—

Tonic Sol-fa Notation.

(1) Half-pulses.
(2) Three and four pulse tones.
(3) Whole pulse rests or weak pulses.

Staff Notation.

(1) Quavers in crotchet time.
(2) The Semibreve.
(3) Minim and crotchet rests.

(73)

d : d	d : dd	d : d	d :—
d : dd	d : d	d : dd	d :—

(74)

d : dd	d : d	d : d	d :—
dd : dd	d : d	d :	d :—

(75)

d : d	dd : dd	d : d	d :
d :	d :	d : d	d :—

(76)

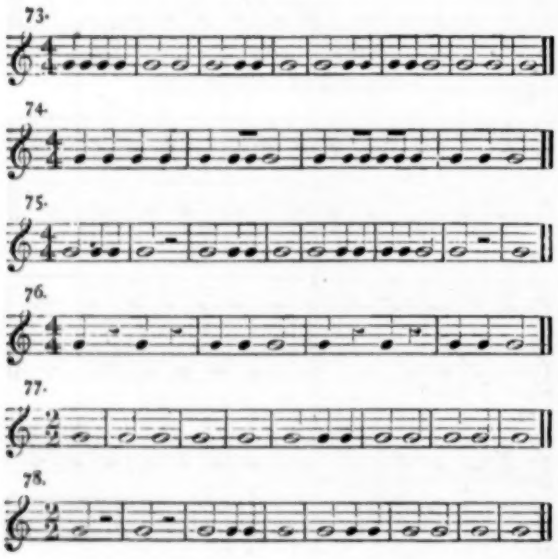
d :— | — :—	d : dd	d :—
d : | d :	dd : dd	d :—

(77)

d :— | d :—	dd : d	d :—
d : | d :	d : d	d :—

(78)

d :— | — :—	dd : dd	d :—
d : | d :	d : dd	d :—

Staff Notation.

Division II.—Standards I. and II.

Ear Tests.

Tonic Sol-fa.—To imitate a simple phrase of not more than four notes, using the syllable 'laa' after hearing the Examiner sing (or play) it twice through.

Staff Notation.—3. To repeat (*i.e.*, imitate, not name) a simple phrase of not more than four notes, using the syllable 'laa' after hearing the Examiner sing (or play) it twice through.

It will be observed that the tones given as a test have not been named, but merely imitated. It is advisable that the imitation exercises should not always be given by the same teacher. If possible, they should sometimes be played.

Preliminary Tests.

Slow classes should hear each group three times before imitating.

It is a good plan to get one quick pupil to imitate before the whole class makes the attempt.

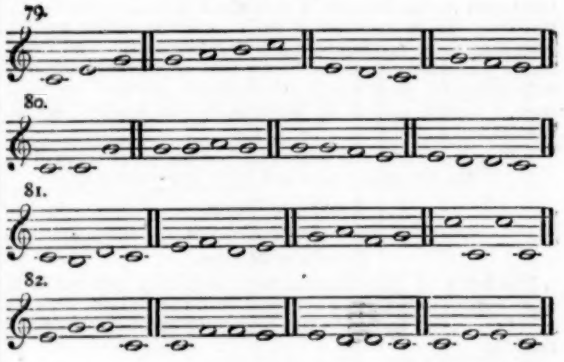
(79)
‖d r s‖s l t d'‖r d‖s f r‖

(80) (Repeated Notes).
‖d d s‖s s l s‖s s f r‖r r r d‖

(81)
‖d t_1 r d‖r f r r‖s l f s‖d' d d' d‖

(82)
‖r s s d‖d f f r‖r r d d‖d r r d‖

Staff Notation.



Standard Tests.

Tonic Sol-fa Notation.

In a low key, say D or C.

(83)
‖s l r r‖r f s d'‖d' t f r‖r r l s‖

(84)
‖r f t_1 e‖s l t_1 d‖r s d' t‖r f l s‖

(85)
‖d' r t l‖s t_1 f r‖r d t_1 f‖r s r d‖

(86)
‖r t_1 d t‖r d l s‖f r d' t‖l r r f‖

In a high key, say F or G.

(87)
‖d s_1 d r‖r t_1 d s_1‖d s_1 s f‖t_1 d s_1 r‖

(88)

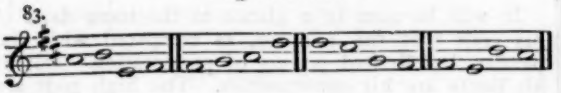
‖m s, d l,‖r t, d f‖m r s, l,‖d t, m d‖

(89)

‖d s s, t,‖r f l, m‖r d t, s,‖l, s, m r‖

Staff Notation.

83.



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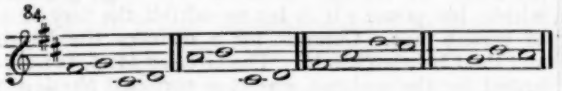

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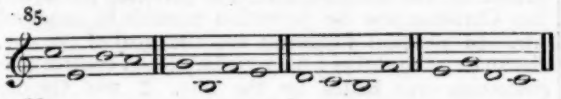
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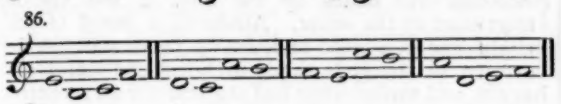

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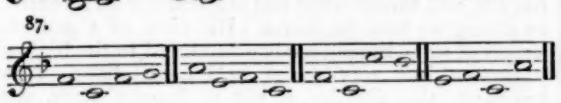

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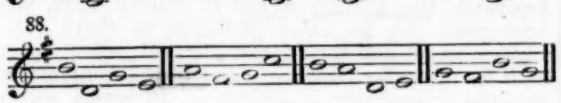

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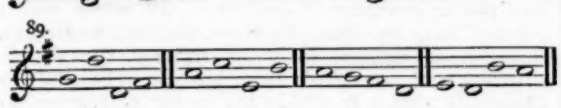


BEYOND THE CODE.

Tonic Sol-fa Notation.

Tests beyond the code should consist of easy passages to be *named*, and of passages of rhythmic tune to be imitated. Stepwise tests beginning on *doh*, *me* or *soh* are the easiest to name. Groups of four consecutive tones are far easier to name than one or two tones.

(Ear tests to be named.)

(90)

‖s l t d'‖d r m f‖d' t l s‖f m r d‖

(91)

‖s l s f m‖d r m f s‖f s l t d'‖s f m r d=

(Arrangements of the doh chord.)

(92)

‖d s m‖d m s‖m d s‖s d m‖m s d‖s m d‖

(93)

‖d m d' s‖d m s d'‖d d' s m‖d d' m s‖

(Rhythmic. Only tune to be named at first.)

(94)

‖ d:s.l | s:m ‖ m:m.r | d:— ‖ d.r:mf | s:— ‖ s.l:s.f | m:— ‖

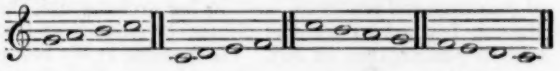
(95)

‖ d:d | d.r:m ‖ s:l.t | d':d ‖ m:m.r | d.m:s ‖ s.f:m.r | d:— ‖

Staff Notation.

To be named.

90.



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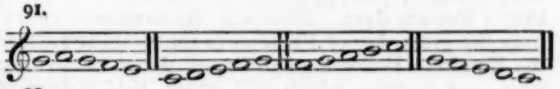

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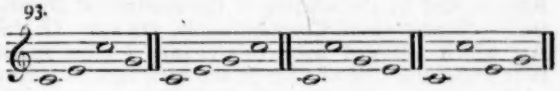
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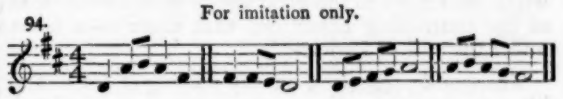

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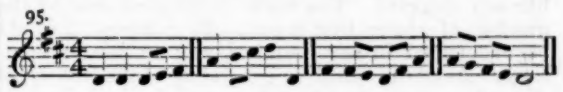

A WAY OF LOOKING AT ART.

BY ERNEST RADFORD.

III.

OWING to some slip of my pen, or some lapse of my mind, there was an obvious fault in my way of stating 'The method of Art Study' in the article which appeared in October. I must ask space for the correction, and beg my readers to accept the following as the proper statement:—

THE METHOD OF ART STUDY.

I. The character of Art work as determined by the social and intellectual environment, or Art as the graphic exponent of Thought and Event.

II. The character of Art work as determined by the Material.

III. The character of Art as determined by its purpose.

In each of these aspects we find a large and separate subject. Formerly in lecturing along these lines I was able to give only four lectures in illustration of Art as the product of circumstance, or, as I here express it, of Art as the graphic exponent of Thought and Event. I spoke first of Greek sculpture: its rapid growth, its climacteric, its decay. I showed how great controlling influences for one short time compelled its greatness, and what changes heralded its decay. I passed from Athens consummate, to Greece decadent. From the Epic of Pheidias to the lyric of Praxiteles. From civic severity to individual indulgence. I noted the conquests of Alexander in Asia, and how Greek institutions took root, and Greek culture everywhere spread in the wake of Alexander's march (B.C. 334, 333, 331—Battles of Granikos, Issos, and Arbela, B.C. 323, death of Alexander). Then next in the four Macedonian wars (from 213 to 148, B.C.) came the fall of Greece before the power of the

Romans. Rome conquered Greece in a physical sense, but only to be subject to an intellectual reconquest. In the literature and philosophy of Greece, in her arts of painting and sculpture, and in her architecture, the Roman learned to see the climax of culture and of human performance in Art. He became at his best a mere imitator. The Greek sculptor became little better than a Roman slave. Such was the downward course from the great day of Pheidias to the establishment of the Empire. Following this line of decay we seek for some new impulse which will arrest this downward career, and give a new stimulus to Art's endeavour. And this new stimulus we find only in the establishment of the Christian religion as the religion of the Empire, and in the settling of Constantine at Byzantium—thenceforward Constantinople, 324 A.D. Of the Art which followed upon this change I must speak later under the title of 'Art in the dark ages.' Meanwhile, we return to the great age of Sculpture to speak of the controlling conditions that came to a climax under the rule of Pericles.

The world progresses, in my reading of its history, like any sluggard. You mark its progress only by the number of *shoves* that it gets. By 'shoves' I would be understood in my harmless way to mean revolutions. As of the world in general so of the history of Art. In changed external conditions it finds new opportunity, and becomes conscious of a *shove* compelling it to some fresh achievement. What power made Athens? In the triumphant conclusion of the Persian war (490-479 B.C.) Athens emerged supreme among the cities of Greece. Desecrated as the city had been, she found in the sight of her ruined walls a stimulus that prompted to fresh achievement. She would show in work of monumental dignity her thanks and her devotion to the gods in whose hands rested the destiny of the city. To re-establish the fallen walls, to rebuild the temples, and to put into all work the magnitude that pride compels, that was the declaration of Athens. Pericles should direct: Pheidias (great sculptor) should be sworn servant of the city. Not given, as the sculptors of Greece's later days, to the interpretation of Luxury's ideals, here he found an opportunity that had not been before and scarce could be again.

In considering this epoch in Greek sculpture, it is almost useless to talk, interesting as it may be, of the origin of Greek art, and of possible influences which may have been received from Egypt or from Persia. The Athenians found in instant facts a power compelling to a triumph in Art. The year 479 B.C. saw the glorious close of the Persian wars and declared Athens the central power of Greece. From 460 to 430 B.C. endured the famous age of Pericles. During these years we see Athens rebuilt, and we see the sculptor, in his glory, working in obedience to a spirit which is not within him to-day. But these great days were of short duration. Between the years B.C. 431 and 404 came the Peloponesian wars, at the conclusion of which Athens had lost her supremacy, and Greece her national character and sense of unity. Sparta, distinguished for her pluck, but not devoted to the Arts, was for a short while supreme in Greece until driven from Thebes by Epaminandos in 379 B.C. Then came Philip of Macedon, then Alexander the Great, who in 335 destroyed Thebes the Spartan stronghold. During all this time Art's was a downward course. To Athens we must return.

I must pass here from matters of fact to matters of thought, and beg you to follow me.

Philosophy has one quest—the True.
Morality has one quest—the Right.
Art has one quest—simply the Representable.

It will be seen in a glance at the mere facts of his craft that the sculptor, as compared with the painter, has limited powers of presentation. But in his limits are his opportunities. The high gods are within his power; it is his to exhibit the very form of perfect man. Contrast for a moment the Pagan and the Christian ideals. The Grecian ideal, as interpreted by the sculptor, was of a perfected physique; the Christian saw no perfection possible in corporeal life. In physical fulfilment was the goal of the one, the snare of the other: an art which could control that perfection was hailed by the one, it was timidly entertained by the other. Athens in a mood of self-delight, and in a mood of desire to make manifest her devotion to the gods, called architect and sculptor to her aid, and surely never had the sculptor an incentive so strong as here he found. His ideal of a god was simply of some human quality developed to the highest perfection, and represented in human shape. How represent this ideality if not in human form, and how could this be unless perfect of its kind? The highest moral and the highest physical beauty found each in the other fulfilment, and in this conjunction was the opportunity of sculpture. In words which I heard long ago from Professor Colvin, the Greeks, regarded as masters in sculpture, had the double advantage of an ideal that brought 'Beliefs,' as Christians phrase it, within the power of representation, whilst for their training they found in the mere life of the people a perfect school. A perfect school, and a realisable ideal. What more does Art need? The ideal of Modern Religion is not of separated gods each deified in the possession of a single qualification. The Christian Ideal is of one god uniting all powers and all virtues in a complete conception; not courting, but defying all the arts of graphic representation. They who would attempt to demonstrate in art, or in any way to picture the Deity of the Monotheist, must abandon all idea of representation and resort to symbol, or what Lessing called 'an arbitrary method of writing.'

In this way of looking we shall come to see how the sculptor in the climax of Athenian affairs found a fullness of opportunity. His was an attainable ideal. Only Athenian gods knew that perfection of physical form which Athenian Art could show. In this high effort we find the culmination of a high ideal and a high endeavour. Couple this fact of a 'realiseable' Ideal with the fact of the 'perfect school' of Art found in Greek life and in her games, and you have somewhat more than a hint of why there was great sculpture in Greece.

In my next paper I shall speak of the establishment of the Christian Church in the Roman Empire, and of the repulsion of Art's impulse found beneath this rule. I must say that to a great extent I shall write under the influence of Mr. J. A. Symonds, of whom I am a devoted follower, though he might well disclaim me as being no child of his. Mr. Symonds has always been to me the Herbert Spencer of the Fine Arts.

SCHOOL LAW.

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CHAPTER IV.

CRIMINAL SCHOOL CHILDREN: REFORMATORY AND INDUSTRIAL SCHOOLS.

Source of Law of Industrial and Reformatory Schools.

The greater part of the legislation affecting reformatory and industrial schools is to be found in the form of a code in the Consolidation Acts of 1866, 29 and 30 Vict. cap. 117, and 29 and 30 Vict. cap. 118. With these Acts must be read the Industrial Schools Amendment Act of 1880, and the Reformatory and Industrial Schools Act of 1891, the full title of which is 'An Act to assist the managers of Reformatory and Industrial Schools in advantageously launching into useful careers the children under their charge,' and also certain sections of the Education Acts of 1870, 1876. As the Reformatory Schools Consolidation Act and the Industrial Schools Consolidation Act were framed on very similar lines, it is convenient to consider them together.

What is a Reformatory School?

The term 'Reformatory School' receives no definition in the Reformatory Schools Act of 1866. It may, however, be defined by implication as a school for the better training of youthful offenders, certified by the Secretary of State under the Act.

What is an Industrial School?

The term 'Industrial School' receives precise definition in the Industrial Schools Act of 1866, section five providing that a school in which industrial training is provided and in which children are lodged, clothed and fed, as well as taught, shall exclusively be termed an Industrial School within the meaning of this Act, and the persons for the time being having the management or control of such a school shall be deemed the managers thereof for the purposes of this Act.

Mode of Certification of Reformatory and Industrial Schools.

No school can be at the same time a certified Reformatory School and a certified Industrial School (section 8, Industrial Schools Act, 1866). But the mode of certification of both these classes of schools is precisely similar. The managers of the school make application to one of Her Majesty's principal Secretaries of State, to direct one of the Inspectors of Prisons appointed to the offices of Inspector of Reformatory Schools and Inspector of Industrial Schools to examine into the condition and regulations of their school and ascertain its fitness for the reception of youthful offenders who come under the Reformatory Acts, or for the reception of children under the Industrial Schools Acts as the case may be. (Reformatory Schools Act, section 4; Industrial Schools Act, sections 6, 7). If satisfied with the Inspector's report, the Secretary of State then certifies that the school is a fit school for the purposes of the Act, and the school becomes a certified school. A notice of the grant of the certificate within the space of a month is inserted by the order of the Secretary of State in the *London Gazette* in the case of English schools, and a copy of the gazette containing the notice is conclusive evidence of the grant. (Reformatory Schools Act, section 11; Industrial Schools Act, section 9.)

Resignation and Withdrawal of Certificates.

It is within the power of the managers—or the executors or administrators of a deceased manager, if there be only one—of a certified reformatory school, or of a certified industrial school; to give notice in writing to the Secretary of State of their intention to resign the certificate of that school, and at the expiration of six months in the case of managers, and one month in the case of executors or administrators, from the receipt of the notice, unless before that time the notice is withdrawn, the certificate is deemed to be resigned, and the school ceases to be a certified reformatory or industrial school. (Reformatory Schools Act, section 7; Industrial Schools Act, section 45.)

Every certified reformatory school, and every certified industrial school, must be inspected by the Inspector of Reformatory and Industrial Schools, or his assistant appointed under the Acts; and should the Secretary of State be dissatisfied with the condition of such a school, he may at any time give notice to the managers that the certificate is withdrawn as from a time specified in the notice, not being less than six months after the date thereof. At the expiration of the time named, the school ceases to be a certified reformatory or industrial school. (Reformatory Schools Act, section 5; Industrial Schools Act, section 44.)

Notice of the resignation or withdrawal of the certificate of a reformatory or industrial school must within a month be advertised by order of the Secretary of State in the *London Gazette.*

Establishment of Reformatory and Industrial Schools.

Section 28 of the Reformatory Schools Act, 1866, and section 12 of the Industrial Schools Act, 1866, provide that subject to the conditions laid down in these sections, a prison authority in England may from time to time contribute such sums of money and on such conditions as they think fit towards the alteration, enlargement or rebuilding of a certified reformatory or industrial school, or towards the support of the inmates of such a school, or towards the management of such a school, or towards the establishment or building of a school intended to be a certified reformatory or industrial school, or towards the purchase of land required either for the use of such an existing school, or for the site of a school intended to be a certified reformatory or industrial school.

Under sections 27 and 28 of the Education Act, 1870, and section 15 of the Education Act, 1876, a school board has the same power of contributing money to an industrial school as is given to a prison authority by section 12 of the Industrial Schools Act, 1866, and, with the consent of a principal Secretary of State, may establish, build and maintain a certified industrial or certified day industrial school. The former is then subject to the provisions of the Industrial Schools Act,

1866, and the latter to the provisions of the Education Act, 1876, governing day industrial schools.

The approval of the Secretary of State expressed in writing is necessary for the establishment and enlargement of reformatory and industrial schools. (Reformatory Schools Act, section 29; Industrial Schools Act, sections 11, 13.)

Classes of 'youthful offenders' to be sent to certified Reformatory Schools in England.

In England, a 'youthful offender' to be sent to a reformatory school must—(i.) be under sixteen in the judgment of the court or magistrate before whom he is tried; (ii.) that court or magistrate must have sentenced him, on his conviction of an offence punishable with penal servitude or imprisonment, to be imprisoned for the term of ten days or longer, (iii.) he must have been previously charged with some crime or offence punishable with penal servitude or imprisonment, unless he is sentenced by a judge of assize, or court of general or quarter sessions. (Reformatory Schools Act, section 14.)

Under section 32, where a youthful offender, sentenced to penal servitude or imprisonment, has been pardoned by the Crown on condition of placing himself under the care of some charitable institution for the reformation of youthful offenders, if under 16 he may be sent to a certified reformatory school for a period of from two to five years. He is then subject to all the provisions of the Act as if originally sentenced to detention in a certified reformatory school.

Classes of children to be detained in Certified Industrial Schools.

The following classes of children may be detained in Industrial Schools. (i.) By the fourteenth section of the Industrial Schools Act of 1866, any person may bring before two justices or a magistrate any child apparently under the age of fourteen who comes under any of the four following descriptions:—

(i.) That is found begging or receiving alms, (whether under the pretext of selling anything or offering anything for sale or not,) or being in any street or public place for the purpose of begging or receiving alms.

(ii.) That is found wandering and not having any home or settled place of abode, or proper guardianship or visible means of subsistence.

(iii.) That is found destitute, either being an orphan or having a surviving parent who is undergoing penal servitude or imprisonment.

(iv.) That frequents the company of reputed thieves.

The justices, or magistrate, on being satisfied that the child does actually come under one of these descriptions and that it is expedient to deal with him under the Act, may then order him to be sent to a certified industrial school.

ii. On non-compliance with an attendance order, under section 12 of the Education Act, 1876, where the parent has used reasonable efforts to enforce compliance with the order, and this is the first case of non-compliance, the child may be sent to a certified industrial school. In any subsequent case of non-compliance the court has the option of sending the child to a certified industrial school.

iii. The first section of the Industrial Schools Amendment Act, 1880, makes provision for 'withdrawing from contamination children who are growing up in the society of depraved and disorderly persons, and extending to them the benefits of industrial school training.'

iv. By section 15 of the Industrial Schools Act of 1866, a child apparently under the age of twelve, who is charged before two justices or a magistrate in England with an offence punishable by imprisonment or a less penalty, but has not been convicted of felony, may, at the discretion of the justices or magistrate, be sent to a certified industrial school.

v. By section 16 of the same Act, two justices or a magistrate may send a child apparently under the age of fourteen to a certified industrial school, if the child's parent or step-parent or guardian makes a representation in court that he is unable to control the child and desires that he may be sent to such a school.

vi. By section 17 of the Act of 1866, a magistrate or two justices may, at his or their discretion, send a child apparently under the age of fourteen to a certified industrial school on a representation being made in court by a parochial board, or by the board of management of a district pauper school, or by the guardians of a union or parish whose office it is to administer relief, that (i.) the said child is maintained in a workhouse or pauper school of a union or parish or in a district pauper school or in the poor-house of a parish; (ii.) he is refractory, *or* is the child of parents either of whom has been convicted of a crime or offence punishable with penal servitude or imprisonment; (iii.) it is desirable he should be sent to an industrial school under this Act.

vii. Under the Prevention of Crime Act, 1871, where any woman is convicted of crime and a previous conviction of crime is proved against her, any child of hers under fourteen who may be under her care and control at the time of her conviction for the last of such crimes, and who has no visible means of subsistence or is without proper guardianship, may be sent to a certified industrial school.

The selection of a Reformatory School.

The selection of the particular school to which a youthful offender is to be sent is regulated by sections 14, 16, and 17 of the Reformatory Schools Act, 1866. It may (i.) be named at the time of passing the sentence, or within seven days afterwards by the court, justices, or magistrate who sentenced him, or (ii.) in default of their mention be named by any visiting justice of the prison to which he is committed at any time before the expiration of his imprisonment, or (iii.) it may be named by the child's parent, &c., under the following circumstances:—

In choosing a certified reformatory school, the court, justices, magistrate or visiting justices are bound to endeavour to ascertain the religious persuasion to which the offender belongs, and as far as possible to select a school conducted in accordance with that religious persuasion. If such a school be not selected, the child's parent, step-parent, or guardian, or, failing the existence of these persons, the god-parent or nearest adult relative of the offender, may apply to the court, justices, or magistrate by whom he was sentenced, or to justices or a magistrate having the like jurisdiction, or to the visiting justices of the prison to which he was committed, to send the offender to a certified reformatory school conducted in accordance with the offender's religious

persuasion. This request must be complied with, providing (i.) That the offender's religious persuasion is proved to be as stated. (ii.) That the application, if not made before the offender has been sent to a certified reformatory school, be made within thirty days after his arrival at such a school. (iii.) That the applicant can show that the managers of the school named by him are willing to receive the offender.

The Secretary of State may at any time order any offender to be removed from one certified reformatory school to another, if the whole period of an offender's detention be not increased by such removal.

The selection of a certified Industrial School.

Sections 18, 20, and 42 of the Industrial Schools Act of 1866 regulate the selection of certified industrial schools.

The order of justices or a magistrate sending a child to such a school—the order of detention as it is called—must specify the name of the school. The managers, however, must be willing to receive the child, and the magistrate or justices are bound to endeavour to ascertain the religious persuasion to which the child belongs, and to select a school conducted in accordance with that persuasion.

If the school selected does not fulfil this condition, the child's parent, step-parent or guardian, or, failing the existence of these persons, his god-parent or nearest adult relative, may state his objection to the school, either to the justices or magistrate who made the order of detention, or to two justices or a magistrate having the like jurisdiction, and name another certified industrial school to which he desires the child may be sent. This will be done if the child's religious persuasion is proved to be as stated, and the application is made before the child is sent to a certified industrial school, or within 30 days after his arrival at the school, provided that the managers of the school can be shown to be willing to receive the child.

The Secretary of State may at any time order a child to be transferred from one certified industrial school to another, provided that the whole period of his detention be not increased thereby.

The Management of Reformatory and Industrial Schools.

With regard to the management of the schools with which they deal, the Reformatory Schools Act of 1866, and the Industrial Schools Act of that year contain such precisely similar provisions that they may be treated together.

i. The reception of a child by the managers of a reformatory or an industrial school binds them to train, teach, clothe, lodge and feed the child during the whole period for which he is liable to be detained in the school, or until the withdrawal or resignation of the certificate of the school takes effect, or until the contribution out of money provided by Parliament towards the custody and maintenance of the children detained in the school is discontinued, whichever shall first happen. (Reformatory Schools Act, 1866, section 8; Industrial Schools Act, 1866, section 18).

It is important to notice that this obligation of the managers ceases from the time of the taking effect of the withdrawal or resignation of the certificate. The mere notice of its withdrawal or resignation does not release them from the requirements above-mentioned, so far as the children actually in the school are concerned, though no new children can be received after the notice.

ii. On such days, and at such times as are from time to time fixed by the Secretary of State, a minister of the religious persuasion to which a child is represented as belonging may visit the school for the purpose of instructing him in the principles of his religion. (Reformatory Schools Act, 1866, sec. 14; Industrial Schools Act, 1866, sec. 25.)

iii. The managers of a certified *industrial* school may permit a child sent to their school, under the Act of 1866, to lodge at the dwelling of his parent, or of any trustworthy and respectable person, provided that the managers teach, train, clothe and feed the child in the school as if he were lodging in the school itself, and report to the Secretary of State in such manner as he thinks fit to require every instance in which they exercise a discretion of this kind. (Industrial Schools Act, 1866, sec. 26.)

iv. The managers of a certified reformatory or industrial school may, at any time after the expiration of eighteen months of the period of detention allotted to a child, by licence under their hands, permit him to live with any trustworthy and respectable person named in the licence, and willing to receive and take charge of him. (Reformatory Schools Act, 1866, sec. 18; Industrial Schools Act, 1866, sec. 27.)

But—(i.) Any licence so granted shall not be in force for more than three months, though it may at any time before the expiration of the three months be renewed for a further period not exceeding three months, to commence from the expiration of the previous period of three months, and so from time to time until the period of the child's detention is expired.

(ii.) Any such licence may be revoked by the managers of the school by writing under their hands at any time before the expiration of such period of three months, and thereupon the child to whom the licence related may be required by the managers of the school by writing under their hands to return to the school.

v. The managers of a certified reformatory or industrial school may, at any time after a child has been thus placed out on licence, if he has conducted himself well during his absence from the school, bind him, with his own consent, apprentice to any trade, calling or service, notwithstanding that his period of detention has not yet expired, and every such binding shall be valid and effectual to all intents and purposes. (Reformatory Schools Act, 1866, sec. 19; Industrial Schools Act, 1866, sec. 28.)

An Act of the past session, the Reformatory and Industrial Schools Act of 1891, passed 'to assist the managers of reformatory and industrial schools in advantageously launching into useful careers the children under their charge,' provides:

That if any youthful offender, or child, detained in, or placed out on licence from, a certified reformatory or industrial school, conducts himself well, the managers of the school may, with his own consent, apprentice him to, or dispose of him in, any trade, calling, or service, or by emigration, notwithstanding that his period of detention has not expired, and such apprenticing or disposition shall be as valid as if the managers were his parents.

Provided that where he is to be disposed of by emigration, and in any case unless he has been detained for twelve months, the consent of the Secretary of State shall also be required.

vi. The managers of a certified reformatory or industrial school may, from time to time, make rules for the management and discipline of the school not inconsistent with the provisions of the Acts. But these rules cannot be enforced till they have been approved in writing by the Secretary of State; nor can any alteration be made in them without his written approval. (Reformatory Schools Act, 1866, sec. 12; Industrial Schools Act, 1866, sec. 29.)

Escape from school and insubordination.

By section 20 of the Reformatory Schools Act, 1866, if any offender detained in a school certified under the Act wilfully neglects or refuses to conform to the rules of the school, he may, on summary conviction before a justice or magistrate having jurisdiction in the place or district where the school is situated, be imprisoned with or without hard labour for a period not exceeding three months in duration. At the expiration of this term of imprisonment, he is then to be brought back by the managers of the school, at their expense, to the school from which he was taken, to be detained there for a period equal to the portion of his period of detention that remained unexpired at the time of his being sent to prison.

In the case of a child *apparently above ten years of age*, whether lodging in the school itself or not, who wilfully neglects or refuses to conform to the rules of a certified industrial school in which he is lawfully detained, the sentence on summary conviction before two justices or a magistrate is imprisonment with or without hard labour for a term not less than 14 days nor more than three months, and the justices or magistrate before whom he is convicted may also direct him to be sent, at the expiration of his term of imprisonment, to a certified reformatory school. (Industrial Schools Act, 1866, section 32.)

With regard to escaping from certified reformatory or industrial schools, a runaway may be apprehended without warrant, and may, on summary conviction before a justice or magistrate having jurisdiction in the place or district where he is found, or in the place or district where the school from which he escaped is situated, in the case of escape from a reformatory school be imprisoned with or without hard labour for a period not exceeding three months. (Reformatory Schools Act, 1866, section 21.) In the case of escape from an industrial school, if apparently not above ten years of age, a runaway is merely sent back to the school to finish his period of detention; but if apparently above that age, he may, at the discretion of the justices or magistrate, instead of being sent back to the same school, be imprisoned with or without hard labour for any term not less than 14 days and not exceeding three months, and the justices or magistrate may direct him to be sent at the expiration of his term of imprisonment to a certified reformatory school. (Industrial Schools Act, 1866, section 33.)

Section 22 of the Reformatory Schools Act, 1866, and section 34 of the Industrial Schools Act, 1866, provide that any person who (i.) knowingly assists, directly or indirectly, any child detained in a certified reformatory or industrial school to escape from the school, or (ii.) directly or indirectly induces such a child to escape from the school, or (iii.) knowingly harbours, conceals, or prevents from returning to the school, or assists in harbouring, concealing, or preventing from returning to the school any child who has escaped from a certified reformatory or industrial school, shall on summary conviction before two justices or a magistrate be liable to a penalty not exceeding £20, or at the discretion of the justices be imprisoned for any term not exceeding two months, with or without hard labour.

By section 13 of the Reformatory Schools Act, 1866, every officer of a certified reformatory school authorised by the managers of the school in writing, signed by them or their secretary, to take charge of any youthful offender sentenced to detention under the Act, for the purpose of conveying him to or from the school, or of bringing him back to the school in case of his escape or refusal to return, shall, for such purpose and while engaged in such duty, have all the powers, protection and privileges, for the purpose of the execution of his duty as a reformatory officer, of a duly appointed constable.

The expenses of Reformatory and Industrial Schools.

The Elementary Education Act of 1891 leaves unrepealed those sections of the Reformatory Schools Act, 1866, and the Industrial Schools Act, 1866, which deal with the expenses of certified reformatory and industrial schools.

The expense of conveying to any certified reformatory school any youthful offender who has been directed to be detained in such a school, and the expense of proper clothing for him requisite for his admission to the school, shall be defrayed as a current expense by the prison authority within whose district he has been last imprisoned. (Reformatory Schools Act, 1866, section 23.)

The guardians of the poor of a union or parish, or the board of management of a district pauper school, or the parochial board of a parish may from time to time, with the consent of the poor law board, contribute such sums as they think fit towards the maintenance of children detained in a certified industrial school on their application. (Industrial Schools Act, 1866, section 37.)

The Commissioners of the Treasury may from time to time contribute, out of money provided by Parliament for the purpose, such sums as the Secretary of State from time to time thinks fit to recommend towards the expenses of the custody and maintenance of children detained in certified reformatory and industrial schools. In the latter case such contributions must not exceed two shillings per head per week for children detained on the application of their parents, step parents or guardians. (Reformatory Schools Act, 1866, section 24; Industrial Schools Act, 1866, section 35.)

Any prison authority may contract with the managers of a certified reformatory or industrial school for the reception and maintenance therein of children ordered by justices to be sent there from the district of the prison authority. (Reformatory Schools Act, 1866, section 27; Industrial Schools Act, 1866, section 36.)

The parent, step-parent or other person for the time being legally liable to maintain a child detained in a certified reformatory or industrial school, must, if of sufficient ability, contribute to his maintenance and training therein a sum not exceeding five shillings per week. On the complaint of the inspector of reformatory and industrial schools, or of any agent of his, or of any constable under the directions of the inspector, at any time during the detention of a child in a certified reformatory or industrial school, two justices or a magistrate having jurisdiction at the place where the person liable as aforesaid resides may, on summons to

the person liable, examine into his ability to maintain the child, and may, if they or he think fit, make an order on him for the payment to the inspector or his agent of such weekly sum, not exceeding five shillings a week, as to them or him seems reasonable, during the whole or any part of the time for which the child is liable to be detained in the school. Every such order may specify the time during which the payment is to be made, or may direct the payment to be made till further order. Every such payment shall go in relief of the charges on the Treasury and be accounted for as the Commissioners of the Treasury direct. The Secretary of State may, at his discretion, remit all or any part of any payment so ordered. (Reformatory Schools Act, 1866, section 25; Industrial Schools Act, 1866, sections 39, 40.)

Discharge and Transfer of Children from Reformatory and Industrial Schools.

With regard to the discharge and transfer of youthful offenders, section 10 of the Reformatory Schools Act, 1866, provides that on the taking effect of the withdrawal or the resignation of the certificate of a reformatory school the youthful offenders detained therein shall be by the order of the Secretary of State either discharged or transferred to some other certified reformatory school. Section 17 of the same Act makes the general provision that the Secretary of State may at any time order any offender to be discharged from a certified reformatory school, or to be removed from one certified reformatory school to another, but so that the whole period of detention of the offender in a reformatory school shall not be increased by such removal.

Sections 41, 42, 43 of the Industrial Schools Act, 1866, regulate the discharge and transfer of children detained in industrial schools. They provide (i.) That no person who has attained the age of sixteen shall be detained in a certified industrial school, except with his consent in writing.

(ii.) That the Secretary of State may at any time order a child to be transferred from one certified industrial school to another, but so that the whole period of his detention be not increased thereby.

(iii.) That the Secretary of State may at any time order any child to be discharged from a certified industrial school, either absolutely or on such conditions as the Secretary of State approves, and the child shall be discharged accordingly.

The parent's power of application for the removal of his child to a reformatory or industrial school conducted in accordance with the child's religious persuasion has been already dealt with under the head of the selection of these schools.

Certified Day Industrial Schools.

The Education Act, 1876, provides for the establishment of day industrial schools in which industrial training, elementary education, and one or more meals a day, but not lodging, are provided for the children. Prison authorities and school boards have the same powers as regards establishing, building, and maintaining or contributing towards day industrial schools as towards industrial schools. Grants for such schools may also be made out of moneys provided by Parliament, not exceeding one shilling per week for each child sent to the school by an order of a court other than an attendance order.

When a school board or school attendance committee are informed by any person of a child within their jurisdiction who is liable to be sent to an industrial school, it is their duty to take proceedings for that purpose unless they think it inexpedient to do so. But a child who, under the Industrial Schools Acts, might be sent to a certified industrial school, may, if the court deem it advisable, be sent to a certified day industrial school. Children sent to a certified day industrial school may be detained there during such hours as may be authorised by the rules of the school approved by the Secretary of State.

When a court of summary jurisdiction orders otherwise than by an attendance order a child to be sent to a certified day industrial school, the parent of the child, if liable to maintain him, may be ordered to contribute a sum not exceeding two shillings a week. It is the duty of the local authority to obtain and enforce the order, and any sums received under it are to be applied in aid of their expenses. If the parent be unable to pay the sum specified in the order, he must apply to the guardians of the parish in which he resides to give him sufficient relief to pay the sum or such part as they consider him unable to pay.

If a local authority and the parent of a child so request, and the parent undertakes to pay such sum, not less than one shilling per week, as a Secretary of State may fix, the managers of a certified day industrial school may receive the child into the school under an attendance order or without an order of court. In such a case, a sum, not exceeding sixpence a week, may be contributed out of moneys provided by Parliament.

The conditions of a parliamentary contribution to a certified day industrial school shall be laid before Parliament, and shall provide for the examination of the children according to the standards of proficiency for the time being in force for the purposes of a parliamentary grant to public elementary schools.

(To be continued.)

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NEW COMPOSITION STORIES.

No. 1.

A JACKDAW IN CHURCH.—During Divine service the other day a jackdaw made its way into the church with the other portion of the congregation, and not only took a lively part in the responses, but also became exceedingly talkative at other times. The whole congregation were in great merriment, the clergyman himself with difficulty kept a serious face, while the school children present broke out into open laughter. Things became so bad that the clergyman was compelled to order the children out of the church. Then an effort was made to capture the jackdaw, who had perched himself boldly upon the reading-desk. The bird, however, was not to be caught, and flew to the rafters above, where it remained till the end of the service, still continuing, more or less, to interrupt the congregation.

No. 2.

LOST IN THE BUSH OF WESTERN AUSTRALIA.—A remarkable story told by Sir Napier Broome is worth repeating for its tragic pathos. One day last autumn the Governor was prevented sending a telegram to Lord Derby because of an accident to the telegraph wire some distance up country. It afterwards transpired that a traveller had been lost in the bush, and, coming to a telegraph post, had lit fire round it and burnt it through causing it to fall and break the wire. He knew that, as soon as the accident was discovered, a repairing party would start off from the nearest station to ascertain the locality of the breakage, and in its speedy arrival lay his sole hope of succour. He was right in his calculation; before the party reached him, however, the unfortunate traveller had died of exhaustion.

NEW DICTATION TESTS.

STANDARDS VI. AND VII.

No. 13.

He told the jury, with every appearance of perfect truthfulness, that he had been very forgetful since; and one of the surgeons who attended him, deposed that he had greatly changed since his accident. In these circumstances, it is impossible to evade the question whether the company were entitled to keep him employed as signalman at a station where trains were liable to be shunted upon the main line. Consideration for an old and valued servant might have been shown by finding him some less responsible employment.

No. 14.

This marks an era in the peaceful progress of Russia in Asia. At this exhibition, special prominence has been given to agriculture generally, and to the culture and manufacture of cotton, silk, wine, and sugar in particular, to horse and cattle breeding, to the local fishing and mining industries, and to the geology and mineralogy of the province.

No. 15.

In a haunted house recently investigated the dog of the philosophers concerned was extremely uneasy, though the philosophers themselves were only disturbed by little boys, who rang the door-bell and ran away. That dogs may, and do, possess ghosts of their own is proved by many remarkable examples. The Mauth dog, which lived in a kind of crypt, under the Castle of Douglas, in the Isle of Man, used to make himself quite at home among the soldiers, till one of them followed him to his retreat, and died a gibbering idiot. This was 'he of whom the story ran, he spoke the spectral hound of Man.'

No. 16.

After an interval of uncertainty, the other guides confessed that they did not know the way back in the dark. This was not pleasant, for the roads were terrible, and during the whole of our journey up, from the port to the Peak, we had met only four people in all bringing down ice to the town. There was therefore not much chance of gaining information from any one on our way down. We wandered about among low bushes, down watercourses, and over rocks for a long time. Horns were blown, and other means of attracting attention were tried; first one and then another of the party meanwhile coming more or less to grief.

No. 17.

There are lights in the cottage windows. Doors are unlocked, unlatched, opened and shut. There is the jingle of tea-cans and pick-heads, and the clatter of clogs on the badly-set pavement and the rougher roadway. Across this threshold there is a flicker of firelight; on that, a woman's earnest face as she bids adieu to her young husband, at the same time listening apprehensively to the cry of her first-born, disturbed in its slumber. Ungainly, muscular forms hustle each other down the village street. The clatter becomes greater. The air echoes with gruff voices. Every man that can wield a pick is running with laughter, jest, or oath to work.

No. 18.

Near the station is also an excellent little hotel, containing a large dining-room and a few bedrooms, kept by two Frenchwomen; and here the Rosarians come out by train to dine and enjoy the fresh air. It was quite dark by the time we arrived, so that we could not see much of the flourishing little colony which has been formed here. Yesterday there was a grand wedding-party near here, the complete success of which was, we were told, somewhat marred by the fact, that for six hours, in the very middle of the day, it became absolutely necessary to light candles, owing to the dense clouds of locusts, about a league in extent, by which the air was darkened.

No. 19.

The accident took place through the flooding of the mine where 25 miners were working. They were employed in drilling when they suddenly struck a vast body of water, which gushed into the mine. The men at once threw down their lamps and tools and made a rush for the entrance of the mine. In five minutes the flood rose to a height of 625 ft., and only six out of the 25 men succeeded in escaping. Ever since that date a large body of the *employés* of Hayden and Co. have been pumping out the flooded mine, and removing the bodies of the dead. Four corpses were found on Sunday at a point which had not been reached by the flood, and it was evident that the unfortunate victims had starved to death.

No. 20.

The larger kind of these birds are extremely stupid, and are easily ridden down by a horseman, or caught in a noose. They rise three times, and after the third flight they are so exhausted and terrified that it is easy to dismount and catch them with the hand, as they lie panting on the long grass. Partridge-hunting is considered good sport. It is necessary to keep your eye constantly fixed upon the bird, and to watch where he settles, and then to gallop to the spot as hard as possible, leaving your horse to look after himself amid the long grass; and this manœuvre has to be repeated until at last the unfortunate bird is overtaken and caught.

No. 21.

If the practical development of electricity as a useful agent for domestic purposes ashore has made but slow progress, the part it already plays afloat is both extensive and satisfactory. Indeed, in a marvellously short space of time has its application for different objects on shipboard become so considerable that he would be a bold man who would venture to express an opinion as to the limits of its sphere of usefulness, even in the near future. Some account, then, of the general direction in which this agent has at present been adopted for maritime uses with success, especially in the Royal Navy, will doubtless prove of general interest.

No. 22.

The air felt fresh when we started, but before we had proceeded far we came into a thick, cold, wet fog, which, after the heat of the last few weeks, seemed to pierce us to the very marrow. Eight miles farther on the four frisky white mules were exchanged for five steady dun-coloured ones, which were in their turn replaced after a seven mile stage by four nice bays, who took us along at a tremendous pace. The sun began by this time to penetrate the mist, and the surrounding country became visible. We found that we were following the course of the river, passing through an avenue of coral trees, loaded with the most brilliant flowers and fruit imaginable, and full of parroquets and fluttering birds of many hues.

No. 23.

The ordinary world, that works in the daylight for bread or fame, is asleep. There is scarcely a sound in the crowded city yonder; and less here on the country side. Even the wind has not thoroughly got up, and drowsily moves the leafless, frosted twigs, through the delicate tracery of which you can see the stars, winking and blinking in the indigo sky, just tipped beyond the pit-gearing with the golden radiance of dawn. The old, narrow lane, deeply rutted with the grinding wheels of heavily-laden coal-carts, and ridged into fantastic unevenness by winter's touch, is, as you stumble along it, the haunt of quietude; but round the bend, about a hundred yards, past the half-dismantled toll-bar house, the mining village is all astir, is instinct with life.

No. 24.

Our lamps are examined and locked, and after a sly inquiry as to whether Ezra has got pipe and tobacco stowed away in one of the pockets of his many-lapped waistcoat, we file out, safety-lamp and stick in grasp, on our long tramp to the workings a mile away. Beyond the gas-lit corridor, and the thick coal pillars, the way is dark and narrow. Now and then we get a glimpse of the pit-rails, of the corve track, or of the steel hauling rope, that hisses by on the pulleys near our feet. As we go with a half-stumble and spring over the wooden sleepers, bending nearly double in places to avoid knocks on the head from the low roof, we catch sight of some saucy trapper lad, pulling whimsical faces at us from behind the props.

No. 25.

The party consisted of a man, a woman, and a lad; and I think I never saw delight more strongly depicted than it was on the faces of the two latter, when they handled, for the first time in their lives probably, some strings of blue, red, and green glass beads. They had two rough pots, made of bark, in the boat, which they also sold, after which they reluctantly departed, quite naked but very happy, shouting and jabbering away in the most inarticulate language imaginable. It was with great difficulty we could make them let go the rope, when we went ahead, and I was quite afraid they would be upset.

No. 26.

Owing to the abundance of keep, both present and prospective, the inquiry for cattle, sheep, and pigs has improved, and prices are much higher than they were a year ago, especially for sheep. The rise on the twelvemonth, as shown in the quotations of the annual autumn fairs, amounts to a sovereign per head on store cattle, of ten shillings on sheep, and of half-a-crown on pigs. The country

is much understocked with farm animals, and the present area devoted to stock-raising and feeding could support, with good farming, an almost indefinite increase in the number of cattle and of sheep. As to pigs, not only should every farmer keep several, if only to clear off various waste forms of food, but every agricultural labourer who has a cottage of his own might have a pig or two to add to his means. The subject of increasing the national wealth in live stock is one which will demand early consideration at the hands of the new Board of Agriculture.

No. 27.

It was impossible to ride down to the spot where we had left the baggage animals, and the descent was consequently very fatiguing, and even painful. At every step our feet sank into a mass of loose scoriæ and ashes; and so we went slipping, sliding, and stumbling along, sometimes running against a rock, and sometimes nearly pitching forwards on our faces. All this too beneath a blazing sun, with the thermometer at 78°, and not a vestige of shade. At last Tom and I reached the bottom, where, after partaking of luncheon and draughts of quinine, we lay down under the shadow of a great rock to recruit our weary frames.

No. 28.

A subway from the Metropolitan Station at King's Cross to the Great Northern terminus is to be forthwith constructed. At such a crowded and dangerous junction of thoroughfares as there is at King's Cross, the need of a subway has long been felt, especially by passengers who have burdens to carry from one station to the other, and this obvious improvement has not been too soon undertaken. There are other dangerous crossings in London where, even although they are not near railway stations, subways are hardly less urgent. It is to be hoped that the King's Cross subway will suggest the construction of many others.

No. 29.

These old trees and hedgerows, these steep banks and straggling thickets are the homes of thrush and ringdove, of pheasant and wood-cock, of dormouse and rabbit. In the topmost boughs of a young elm a thrush is singing, his dark form clear against the sky, while the wind tosses the branches as if to shake him from his foothold. This is a haunt of the nightingale. These damp thickets are the very place for the chief of singers. Yesterday he was singing here, but he is silent now, and the thrush has it all his own way. It would be hard even for the nightingale to rival that magnificent melody.

No. 30.

Here the sun is warm, the air is still. The keen wind that whistles through the ragged hedgerows overhead hardly lifts the faded fronds of shield-fern that droop along the bank. The voices from the world outside are but the low sounds of sheep in distant pastures, the songs of the larks far upon the pale sky, the occasional clamour of the wild ducks on the pool on the hill, or the plaintive cries of the peewits that wheel over the windy fields. Now and then one of the birds flies over, the strange throbbing of its powerful pinions plain above all other sounds, and its long plume, its snowy breast, the dark tips of its ragged wings drawn clearly on the sky. Warm as the sun is on the slopes of this deep hollow, the trees and thickets are all bare and shelterless.

No. 31.

Among the dead leaves is the ceaseless stir of innumerable faint sounds—sometimes merely of dry fern or oak-leaf rustling uneasily in the wind, sometimes the noise of tiny footsteps, mouse or bird, sometimes perhaps even the mere movement of unfolding leaves. Narrow as are the limits of this little glen it is a stage crowded with wild actors, playing each his part, unconscious or careless of comrades or spectators, some acting merely in dumb show, some pouring out their hearts in song, some uttering voices in themselves but harsh and dissonant, yet all blended perfectly in the great harmony.

No. 32.

The dry leaves of many summers lie thickly on the ground, and the new growth rising through them has not gained strength enough to hide the sad colours of the autumn. The sharp points of the springing blue-bell leaves, the vivid green of the unfolding wood-sorrel, the sober-hued dog's mercury, the nettle, all too faithful follower of man, the golden green of opening saxifrage that lines the wandering brook, are all a month behind their time. Even the coltsfoot, that by this time should have changed its flowers of gold for crowns of feathery seeds, is blossoming still.

No. 33.

But suddenly there came a vague inarticulate murmur from the opposite side of the panelled room. The figure paused, seemed to listen, and presently withdrew to the wall, where it disappeared. Next morning the occupant of the room, finding his dog cold in death, with an awful expression of supernatural horror frozen on his features, was of course annoyed. He accused his friend of inhospitable conduct, in subjecting a valuable hound to such a trial, and threatened to appeal to the Society for the Prevention of Cruelty to Animals.

No. 34.

One of the party of three Englishmen and a lady who reached the summit last week writes to us:—We did arrive at the top, although it was rather late in the day. Although one of our party suffered from the cold in one of his hands, yet it was by no means frost-bitten, and it is now perfectly well. Owing to our having tried to descend by another route, we were obliged to go so slowly that we thought it best at seven o'clock in the evening to stay where we were for the night. As we were lucky enough to be able to light a fire, we did not suffer as much as might have been expected. The expedition itself offers no difficulty to moderate climbers, but owing to the immense amount of snow which has fallen this spring, it requires almost double the time that is ordinarily necessary.

No. 35.

But the friend asserted his perfect innocence, nay, his ignorance of the fact that there was any ghost in his establishment. He was fortunately able to appeal to his Census return, in which no such inmate was mentioned. He had but recently become the possessor of the house, an old one, and to investigate the matter he removed the panelling of the haunted room. Behind one panel was found a headless female skeleton in decaying satin, and wearing the family diamonds, which were missed in the 17th century. Behind the panel where the vague inarticulate murmur which stopped the ghost proceeded, was discovered the head or rather the skull of the skeleton.

No. 36

When is the spring coming, is a question which is upon every one's lips. Here we are past the middle of April, and even the desecrated primrose is hardly in full bloom. Week after week the wind has blown from the north or east, bringing us the chilly temperatures of the Arctic regions of the Baltic, while the sky has been cloudy by day and clear by night. Now and then the sun has paid us a passing visit of a day, giving us some slight taste of the warmth which the time of year demands, but the nipping wind has almost neutralised his rays so far as they could stimulate the tardy swelling of the buds.

No. 37.

Thus the pressure of the atmosphere has been abnormally high all the winter, therefore it must be abnormally low all the summer to bring the average right. The consequence will be very wet weather. But it is equally reasonable to say that the unusual cold must be followed by unusual heat, also to give the correct average. Thus two opposite conclusions give the *reductio ad absurdum* to all such attempts to gauge the future. All we know is that the great and pressing need of British agriculture is a few days of balmy weather with warm rain and a genial sun—some of the genuine April showers which 'bring May flowers.'

No. 38.

Vessels leaving and entering the Tyne may be classified under four heads. First come the great 'liners,' vessels which run regularly to and from distant ports at advertised dates, and bound, for the most part, by contracts to carry mails. That which is written of them later may be taken to apply to 'liners' belonging to all ports. Next comes a very large class of vessels known to the shipping world by the familiar name of 'tramps.' The name, by the way, is not altogether appropriate, for the marine 'tramp' roams round the world in search of profitable employment, whereas its human prototype wanders in the pursuit of idleness as a fine art.

No. 39.

Then, for a while, the banks have a desolate appearance. Upon the north side, upon which they rise to a great height, ruined cottages and silent buildings seem to speak of enterprises which have failed or have been worked out; but lower down the clank of hammers is incessant, and upon either bank may be seen an endless series of iron vessels, destined for employment in peace and in war. Finally, as one progresses down the river, the crowd of shipping increases, for the great vessels do not as a rule come up higher than the docks, and the whole impression of a great port is produced. The imports of the Tyne are considerable, but not to be compared to her exports.

DAPHNE'S DARING.

BY MRS. A. PHILLIPS.

Author of 'Man Proposes,' 'Benedicta,' 'By the Cards,' &c.

CHAPTER X.

'What storm is this that blows so contrary?'

It happened not to be a busy day with Mr. Lee that day, so he thought he would take a holiday and not go to the office. He was feeling tired after the events of yesterday. 'These balls and nonsenses were kept up so late now-a-days, and having supper at midnight, a man could not go to bed the moment he had swallowed it without danger of apoplexy, so that it was three or four in the morning before a man could safely go to his bed. He must really knock them off, they were destroying him'—was the mental conclusion at which Mr. Lee arrived, as he wiped his glasses and placed them on his nose preparatory to his morning search in the day's newspaper as to what the grand old world was doing.

He had not sat very long poring over this minister's policy and that one's foreign diplomacy, when a servant came into the room and handed him a letter.

'Any answer?' he inquired.

'No, sir, if you please. It was the housekeeper from Mr. Grey's as left it, and went away, so I suppose there is no answer.'

He proceeded to open the envelope in the same orderly manner in which he did everything, by inserting his penknife across the top, as though he were cutting the leaves of a book. Then as leisurely he unfolded it and began to read. Presently, as its contents became clearer to his mind and finally lodged in his brain, he exclaimed aloud—

'Bless my soul! By Jove! Here's a pretty how-d'-y'-do!'

The human animal has its cries or barks. What are these exclamatory calls but animal utterances that relieve only the overcharged sense of wonder, or anger, or grief, that may happen to oppress it? It is not until we begin to speak and reason that the human entity asserts itself, and we take our rank again as beings 'little lower than the angels.'

Having come to the end of his barks, Mr. Lee began to read through the letter again, deliberately annotating as he went along.

'Wants to marry my daughter, does he? . . . Income not bad, though, by Jove! . . . "Has expectations." Yes, I know, and capital ones they are. "But must return to Mexico." That's bad,' he exclaimed, as his under-lip shot out, 'that's bad—deuced bad. "But he will devote himself to her happiness,"' he read aloud, glancing at the last paragraph of the letter.

'Of course, of course, they all say that, whether they do it or not,' he thought, as he laid the letter down and leant back in his chair, exclaiming,

'Bless me! how extraordinary!'

Then he gave a lift to his glasses on to his forehead, in order that he might rub his eyes—first of all to assure himself that he was wide awake after last night's no rest, and perhaps also to send a little more light into his intellect.

'Bless me! What's to be done now? I wonder where Anna is'—turning at once to his tower of strength and refuge in all difficulties, his wife, without whose advice and opinion he never moved hand or foot when any matter of real importance had to be decided on.

'I wonder if she has gone out.'

Rising, he left the room; and, going to the bottom of the stairs, he shouted up, 'Anna! Anna!'

'Coming,' came echoing down over the stairs to his ear from the good mother, who was above.

Satisfied that relief was at hand, he returned to the dining-room, and, lowering his spectacles, took up the letter, and read it again.

Presently Mrs. Lee came into the room, looking rather put out.

'I do wish, John, my dear, you would not shout to me from the bottom of the stairs as you do. You know I dislike it. I declare I am shaking all over from the nervous fright you have given me. Why don't you ring the bell, and send a message by the servant, when you want me? It is such a bad example to be screaming about the house in this way.'

'My dear, I am very sorry,' said Mr. Lee, anxious to be propitiatory, and bearing the reproof with ominous meekness. 'I had something very particular to say to you. I cannot decide on the matter without your advice. I am in a most perplexed state. I have just received a letter from Mr. Grey. He wants to marry Daphne.'

'*What!*' echoed the good mother, aghast, and turning pale.

In that 'what' there rang the scream of the hen when a fox peeps into the roost and threatens her brood.

Then she grew indignant. 'What do we know of him? I think it a great impertinence, to say the least of it.'

Here was a man who dared to attack her cherished scheme, and wanted to rob her old age of its chief joy. She did well to be angry, she felt.

'My dear, you can hardly call it an impertinence,' expostulated Mr. Lee in soothing tones. 'He means well, I am sure; but here is his letter. Read it for yourself, and you will see what he says. Very fair; a very fair offer on the whole, I think, for us to expect. Only I feel surprised that it has come so suddenly. I was unprepared for it. He has only been in the house twice, I think?' he asked, handing her the letter, which she took as she commenced a trembling search for her glasses in one of the many pockets she carried about her housewifely, comfortable person. But in the agitation of her husband's sudden call, she had left them, unusually for her, upstairs. So she handed it back to him, saying,

'I am too nervous to read it; please do so for me.'

As he read it through, she kept beating time to every paragraph with a nervous twitch of her hand and feet. When it was finished, she burst out indignantly—

'And he has the audacity to ask you to let him take her to that outlandish place, Mexico! I declare I don't believe I could tell you this minute where it is on the map. I only know it is at the other end of the world, and full of cut-throats and blacks. Why, didn't they shoot their own king, Maximilian, an emperor's son; and drive his poor wife crazy? A likely thing, indeed, I am going to give my girl to a man who wants to take her off there—to be murdered in her bed some fine morning. Never! *You* may do as you please, John Lee; but to my dying day he shall never have my consent to marrying my child. So you had better write and tell him so.'

The good mother was tragic. She was one of those women whose feelings are accentuated by action. Her attitudes fell easily into the mould of her mind, and expressed actively what she desired to impress. A finished actress might have studied her spontaneous movements and gained the climax of achievement.

'But stop a bit,' said Mr. Lee, the fine edge of his diplomacy giving way before such a wedge of decision; for he saw a good income and better connections for his daughter slipping away—benefits he was loth to let go if he could manage to secure them without a domestic hurricane.

'But stop a bit. You fly off so fast. There's *no* arguing with women or trying to make them see things in a reasonable light. They puff and bluster and fly off so at once,' he said, sending his arms abroad to suit his action to the word and symbolise a woman's reasoning faculties.

'Then I suppose you want her to be murdered,' returned the good mother, bringing down her heavy artillery of blunt satire to meet her husband's temporising and want of reverence for her reason. 'Or if she is lucky enough to escape that, perhaps there's the yellow fever she can die of.'

The idea wrought a fit of indignation. From satire she passed to fact.

'Why, has he not come home himself because he nearly died of fever, and looking as yellow as a kite's claw? But there, that's you all over, John Lee,' she exclaimed, reverting once more to satire. 'The first man or woman who catches

you by the ear and whispers of a good income and better connections can twist you round their little finger,' she said, throwing a contemptuous glance at his want of purpose.

'Now, my dear woman,' he retorts, growing impatient, 'will you hold your tongue and not talk nonsense? One would think, to hear you talk, that I had married her to him already. Who is going to allow her to be murdered or die of fever? I am sure I am not. Only you don't give a man time to speak, but you are down his throat in a shot, and up again before he has had time to open his lips. Now, my dear woman, if we are to settle this matter as you want it, you must be quieter and listen to me. It is a delicate thing to manage. I would any day rather survey a county than refuse a gentleman when he makes me such a very fair offer as this. It is a deuced awkward business, let me tell you.'

'Leave it to me, then.'

'Be quiet, do; and allow me to speak.'

'Ah, yes, talk on. You can do that by the yard,' said the poor, threatened mother.

'Bless me, was a man ever so tried! Hear me out, do, like a good woman. I don't like the idea of Mexico any more than you do yourself. It is one of those countries one is never sure of. But there is no use denying it is a very good offer for the girl; for he is nephew to old Sir Philip Grey, the Member.'

'Oh, don't hang your hopes on that peg, for you know he has just married a young wife,' broke in the mother.

'I know he has, but there is still the chance of this man coming in for the property.'

'Don't talk to me, John!' cried the mother, almost beside herself, as she saw that her husband was leaning towards the enemy. 'If he were the nephew of fifty Members it would make no difference in my opinion. If you were to argue until midnight, it would never make me give my consent for my girl to be carried off from under my eyes by the first man who fancies her and asks her to follow him to any ungodly place he happens to earn his living in. If she *must* marry—though I see no occasion for it, for she has every comfort heart can wish for in her own home—why, there are plenty of respectable young men in the town—young Charley Morris, for instance—that she can have. So don't hold out any bait to me, John Lee, about his being nephew to the Member, for you know I am too old and two well satisfied with my own position in the world to care for any such gilding. On the contrary, I am not a woman to stand being looked down upon. I don't want my girl to marry into any family that might consider her father and mother not good enough to visit.'

Here the good mother gave one of her defiant little sniffs, which John Lee and all her family knew meant an amount of resolution against which there was no appeal.

The discussion might have gone on to interminable and unsatisfactory lengths had not the good mother determined to call in the aid of an ally.

'You had better send for James. It is right he should help us out of the difficulty.'

'Not a bad idea,' said Mr. Lee, thankful for an excuse to stop the 'letting out of water' that his wife's tongue threatened. 'We'll send round for him. There's not much doing at the office to-day. Send some one round at once.'

'I will,' she said, rising to do so. She returned a few minutes later with her work—a baby's sock—into which she wrought all the nervous energy that agitated her mind.

Mr. Lee resumed the paper. His mind could only grasp the short paragraphs and the advertisements. His own kingdom was in a state of difficulty requiring the diplomacy of an experienced minister. What, under the circumstances, could he care for the politics of the kingdoms of the earth, which for the majority are only a game to be enjoyed at one's leisure? In the study of advertisements he bethought him of his daughter.

'Where is the girl?' he asked.

'I am sure I can't say. At her sister's, or with old Lotty Barton. She is generally to be found there if nowhere else.'

'It is to be hoped she knows nothing about this matter. I expect not, for I remarked that he was not very attentive last night. Since the day of the picnic I have noticed nothing particular. Have you?'

'Never; but never mind her now. I hear James coming.'

James, giving the front door a slam as if in haste, and dashing his hat on the hall table, now burst into the dining-room, looking hot and anxious. It was something so unusual for him to be summoned from office at any time.

'What is it? What has happened?' he asked, out of breath, and alarmed at the grave looks of his parents, as he wiped his damp forehead.

'There, don't be flurried; compose yourself. No harm has happened,' said Mr. Lee, 'only there's a little matter your mother and I want your opinion on.'

'Oh,' exclaimed James, much relieved; 'I was afraid of an accident.'

'It is nearly as bad,' said the good mother, shaking her head and knitting furiously.

'Now, mother,' interrupted Mr. Lee, 'if James's advice is to be of any use to us, he must be unbiassed. Let me explain matters,' he said, with a commanding wave of his hand to remind her that he was the head of the family and occupied the chair at this council. 'Do, I entreat of you, my dear woman, keep quiet and do not let your tongue run on.' Then with some importance of manner, as befitted the occasion, he turned to his son and began,

'You see, James, we are awkwardly placed.'

'Father's nothing if not prolix,' thought James, who longed to get at the gist of the whole matter in a moment; but he knew his father would not hurry a period to save his life.

'Your old schoolfellow,' Mr. Lee went on to say, giving every word its due place and accent—'your old schoolfellow, Mr. Grey, has just written me a letter—a very gentlemanly letter—containing a fair offer--a very fair offer, very fair indeed, I must confess,' handing the epistle across to James, who looked at it—'in which he asks my consent to marry Daphne. I feel surprised. I never expected anything of the sort; and I am quite at a loss how to act, or what to say, that is—how to refuse—' for his soul hankered after the 'good income and better connections.' 'Still I don't want to endanger her life by letting her go to Mexico, where it seems he must return, or forfeit his appointment, that being his place of residence,' said Mr. Lee, with the pomposity the occasion demanded.

Here the good mother interposed an impatient gesture, regardless of the check put upon her 'woman's tongue,' and blurted out.

'His place of residence will soon be the graveyard, I should say—but he shan't drag my Daphne there if I can help it.'

In the meantime James had been reading the letter. Good, upright, steady James. One of the 'ninety and nine' of this life who are so constituted that they never deviate from the path of duty—one of the many who, while accepting the dogma of repentance, decline to give the penitent a place in their bosom. James sat pondering how to act with regard to the rumour Captain Glossop had mentioned. It involved some hidden circumstance that affected Grey, and was evidently not to his advantage. His father and mother were waiting for him to speak. He concluded that in the absence of positive knowledge it was best to be on the safe side. So he said,

'If you ask me my advice, you will have nothing to say to the matter. Write and decline it, with thanks. I have reason to believe that Daphne's chances of happiness with a man like Grey would be precarious. He is one of those good-looking men whom women cannot see without falling in love with, and then there comes mischief, either actual or supposed. I am told he got himself into a scrape once. I can't tell if he is out of it yet, as, of course, it is not a question one would like to put. But I don't think, with such a rumour tacked on to a man's name, it would be right for us to give a girl like Daphne to him. But then, this is simply my opinion. You can, of course, do as you please.'

'But, James!' cried both father and mother at once, their eyes wide open and intent with wonder, 'wherever did you hear all this?'

'Oh, I heard it, never mind where; but I can answer for the truth of what I am saying.'

'Of course, it is true,' cried the good mother, who saw in James's story the relief that comes to a beleagured city. Her cause was gained. Imagination strengthened her position as she said,

'Why, he looks bad enough for anything. That finishes the matter, John Lee. You must write at once and refuse him.'

'All very fine, marm,' cried the discomfited John, 'but what am I to say? I can't charge him with the offences given him by a rumour, whatever they may be.'

'Say?' echoed the mother, irritably, 'say what is the truth at once, that we don't want him.'

'My dear Anna, do be sensible.'

'So I am, John. We don't want him, not any of us.'

Poor little Daphne! Never a thought of what she might like to say did these well-meaning people give. She was their lawful property, to be disposed of as they pleased, without any reference to the fact that within her throbbed a woman's heart first awakened to the call of love. Tyranny and despotism are qualities not confined alone to kings and rulers. In domestic law and love they have a very hot bed. A selfish love is the worst of tyrants, and the world is full of ruined lives that have had to bend under the yoke of domestic despotism.

'Well, James,' said his father, at last, 'I wish you would draft me a letter, and I'll copy it. Be careful how you word it. That is all.'

He said this with regret, for he liked the 'income and expectations.'

'Don't you think we ought to tell Daphne?' James suggested. 'You see she knows nothing about Grey. I don't know whether he may have spoken. You had better get my mother to talk to her and hear what she has to say.'

'Perhaps you are right. Anna, I wish you would explain everything and why we disapprove of her forming such an alliance,' said Mr. Lee, growing pompous, and using the only word he found equal to the importance of the occasion, in refusing the nephew of a baronet and a member of Parliament.

'Very good,' said Mrs. Lee, rising a little reluctantly it is true; for she thought the matter could be very well settled without any reference whatever to Daphne. Why disturb the girl's mind with such an unwholesome subject? Why tell her more about this man than she did years ago when some unwise friend had given her a present of a whole pound of macaroon biscuits, which, not being good for her, she locked away and never told her of the gift? Explanations were unnecessary things where children were properly brought up as hers had been, thank God. But as James and the girl's father seemed to think it was right she should be told, she would go up and settle the matter at once.

She left the room and went upstairs.

Putting her head into Daphne's room as she passed, she called the girl to speak to her.

'Ah, here it is?' thought Daphne, her heart giving great thumps as the colour died out of her cheeks and her limbs trembled with the violence of her emotions. Pressing her hands across her eyes for a moment, and giving herself a shake to nerve her for what was coming, she prepared to follow her mother, and hear her sentence of life or death.

(To be continued.)

COMMON-SENSE LESSONS IN EVERY DAY HOUSEWORK.

BY MRS. E. A. SHARMAN,
Lecturer to the National Health Society.

Daily Cleaning.

Having become acquainted with the principal ways of rough cleaning, you can now begin to apply such methods daily. In all homes there is certain work which cannot be done by fits and starts, but must be attacked daily all the year round. If one person undertakes such work for a fortnight or month, resigning it at the end of the time to a younger sister, all the girls of a house would then have a chance of becoming experienced in methodical housework without feeling it derogatory as a great many girls do, and are in the habit of speaking of household management now-a-days. The girl whose duty it is for the time being to perform such work ought to set about it cheerfully and willingly. Mothers should insist upon girls being good tempered while at work. Learning to accept one's duty cheerfully is a great help in performing it. Household work must be done, so may as well be done quietly, and with as much comfort to one's self and others as is possible. There are many kinds of work needed to keep a home clean. Learn to be a good contriver of work. By exercising forethought and good management a girl may gain hours of leisure she would not otherwise have if she set about her work at the wrong time, doing that first which should be last, and thus making the family thoroughly uncomfortable, and wasting her own time and that of others. The peace and comfort of a family is promoted by using forethought, a valuable quality to possess, but often sadly wanting in young persons. Among the many kinds of work which have to be done daily is the quick cleaning of a carpeted sitting-room. It is often not possible or desirable to thoroughly clean a room every time after using it for an evening; therefore girls must learn a quick method of making a room look tidy and comfortable. Make a point of always having the room as tidy as possible before leaving it for the night. Insist upon children putting toys, books, and work away before going to bed. They will thus grow up thoughtful and methodical in their habits, and be a great help to mother and elder sisters. The every-day room of a small house is usually cleaned in the forenoon. Often a half an hour daily is all the time that can be spared for this work, which is necessarily all on the surface. There will be no need of folding up curtains, tablecloths, antimacassars, etc., as is usual for weekly cleaning. Newspapers opened out and spread here and there, where much dust is likely to settle, cover everything up, and so save things from getting a dingy appearance. It is always wise to carry the fender and fire-irons into the kitchen to be cleaned, thus saving the carpet in front of the fireplace from becoming spoilt from blacklead dust. Nothing improves the look of a room, or is noticed sooner on entering a room, than the fireplace. If a high polish is always kept upon it and its fittings an unswept carpet never looks so glaring. Remember that the thing which there is time every day to keep in a high state of cleanliness and polish, is kept in the same state with less time and trouble, than if only cleaned properly once a week. But it is not always possible to keep things so clean in a cottage home where so much other work has to be got through, so let your chief efforts centre on the fireplace and dusting. Lay a strip of clean canvas on the floor before beginning to remove ashes, and be careful not to raise too much dust when sweeping. The bars of the fireplace ought always to be blackleaded, and the sides and rest of the ironwork merely brushed. Finish by cleaning the hearth, and if it is whitened, let it be quite dry before replacing the bright fire-irons upon it, or they will look dull and rusty. Sweep all crumbs and bits

from the middle of the carpet, and shake the hearth-rug. If the edges of the room are stained, they must be dusted every day. The room will now need no more rough work doing to it. Take the newspapers away, and carefully dust everything and everywhere with a *linen* duster; cotton dusters leave white specks behind. Dust ledges, window-panes, and wainscoting, and finish the room by arranging curtains, table-cloth and antimacassars in their proper places without having the look of being thrown there. It is a careless and idle way to *flick* dust off furniture, and accidents often happen through it; dust should be wiped off slowly, so that it may not fly about again. A few flowers or green leaves improve the look of a room. Close the door after you when the room is finished, or it will soon be no better for having been done. Do not be afraid of opening the window to let in fresh air. If the door is closed there can be no draught.

More or less surface cleaning must be done in a bedroom every day. After making a bed you should sweep under it, and mop up the loose dust from the uncovered part of the floor with a damp cloth. This is a wise precaution in hot weather, and helps to keep the room sweet and free from the faint closeness often felt in town bedrooms.

If the stair carpet in a small house is not swept or dusted down every day it will have a shabby appearance for most of the week, which would be a great pity, for a nice fresh-looking stair carpet gives great finish to a small hall, being with the stair rods often the one point of attraction in it. By cleaning a little every day, things will never get very dirty, and your work will be done much earlier on Saturday.

To clean a Ceiling.—Dirt settles on ceilings and walls in the same manner as it settles upon the floor, and the best rule is to get rid of it as quickly as possible. Nothing disfigures a ceiling more than cobwebs in the corners, or hanging from the plaster moulding which runs round the ceiling of a room. The ceiling must therefore be frequently swept and *dusted*, as well as periodically whitewashed, papered, or painted. If you use the room much, and have gas in it, the top will soon be disfigured with smoke and need entirely renovating twice a year. As the rooms are generally low in small houses, a papered ceiling would be quite out of place, because it becomes so soon dirtied. A painted ceiling wears well and can be kept clean by frequent washing, but is not often found in small houses. Whitewashed plaster ceilings, which are the most common, can be kept clean in the following manner: Sweep all dust and fluff out of the corners and mouldings with a clean long sweeping brush, then pin a clean cloth over the head of the brush, in such a manner that it cannot slip off, and *dust* the flat part of the ceiling, rubbing it slightly while doing so. Shake the cloth out of doors, and then pin it upon a hand brush. You must mount wooden steps, or find some other means of reaching the top of the room, and dust into corners and crevices, rubbing slightly while you do it. This process ought to be done fortnightly, but cobwebs should be removed daily. The ceiling of the room will then look clean and fresh for a long time, especially if gas is not used for lighting. As soon as the moulding has the appearance of being traced in black, the ceiling ought to be whitewashed.

To clean Papered Walls.—No method must be used that will wear and spoil the paper. If dust is left upon papered walls it renders the air impure, and discolours the paper. Paper being a porous substance, has the power of taking up moisture or smell from the air. After a time it begins to decay, and causes a close smell in a small room. The old paper ought to be torn away, and a new one put in its place. Papered walls being slightly rough, should be swept gently with a soft hair brush, and then dusted with a soft cloth. Rough strokes will quickly wear holes in the paper. If there are any dirty places or marks which cannot be removed by sweeping and gentle dusting, take a soft crust of stale bread, and rub the particular spot with it. The paper near the entrance of a room becomes discoloured sooner than any other part owing to more dust gathering upon it, and one's clothing brushing over it when entering the room. Rub the paper gently in a circular direction with a lump of dough made from flour and water, and kneaded smoothly together. While rubbing pull the dough apart, and knead the soiled part inwards. When the dough looks dirty, burn it, and take a fresh piece to finish with. Painted walls should be swept down with a soft hair broom, then dusted. If spotted anywhere, wash with a little lukewarm water, having no soap or soda in it, which would cause the paint to become discoloured and faded.

Walls done in distemper cannot be cleaned successfully otherwise than by having them coloured afresh. Distemper is better than either whitewash or paper, and costs very little; but it is liable to show every soil or mark very plain, and these are difficult to remove by ordinary means. Glazed or varnished paper used formerly to be made to suit passages and halls only, but can now be bought suitable for rooms. It will bear washing with soapy lukewarm water occasionally, but must be dried with a cloth immediately or the varnish will become dull, and the paper shell off. A sitting-room which is constantly occupied by a family requires thoroughly cleaning from top to bottom once every two months.

AN OCTOBER INSPECTION.

STANDARD I.

Reading.—A third of the class took this subject.

Writing.—A third were told to open the reading-book at any page and write a line.

Arithmetic—

1. In a shop were some baskets. In the first there were 504 apples, in the second 467, in the third 246, in the fourth 106, and in a small basket 54.

Questions.—What do we want to find? We have a small sum in what?

2. A man was born in the year 1802. He died in the year 1879.

Questions.—What do we want to find? We now have a small sum in what?

Add the answer and the bottom line together, and we shall have the top line. What is that called?

Mental Arithmetic—

1. If oranges are 3 for 2d., what will a dozen cost?
2. A boy has 20 farthings; how many pennies has he?
3. Three times six.
4. A man goes eight miles an hour. How many miles will he go in 3 hours?

5. How many sixpences are there in half-a-crown?
6. Add 8, 5, and 3.
7. Add 7 and 3, and take away 5.
8. How many halfpence are there in 3½d.?
9. 6 times 8.
10. 3 times 7.
11. Take 7 from 20.
12. I had 40 eggs; how many more did I want to make 100?

Geography.—Questions were asked on cardboard model of school. Some questions were asked on the town, as, Is it hilly?

1. Where does the sun rise?
2. Where does it set?
3. Have you ever seen it in the north?
4. Who sees it in the north?
5. What part of the day does it rise?
6. When does it set?
7. Does the sun move?
8. What does move?
9. What country has day when we have night?
10. Is the heat of the sun as warm in winter as in summer?

Grammar—

1. What is a noun?
2. What kinds do you know?
3. What kind of a noun is this paper? (A paper was shown.)
4. Why not?
5. What belonging to it is the noun?
6. Show a noun in your hand.
7. Why?
8. Pick the nouns out of the following:—I had a dog. Cows give milk. Boys come to school.
9. In 'The farmer milks the cow' is *milks* a noun?

Recitation.—A boy was called upon to say a verse, then the class to say one simultaneously, and so alternately.

Standard II.

Reading.—A third of the class read, and numerous questions were asked on the meanings of words.

Writing.—The following was dictated by the teacher to a third of the class:—

The dolls could not swim, so Fanny kindly dragged them out of the water. Tabby ran off downstairs dripping wet. Doll Dinks was hollow and could float, but poor Doll Midget was drowned.

Arithmetic.—A third of the class took this subject, and the inspector gave the sums slowly, dictating them twice.

The sums were all in problem form, and questions were asked upon them.

1. A farmer had 42,215 sheep, he sold 24,316; how many had he left?
2. In a street there are 415 people. How many are there in 490 such streets?
3. If I divide 50,607 oranges among 8 boys, how many will each get?
4. In Barnsley there are 26,416 people and in Doncaster 20,229. How many are there in both towns?

Note.—In the division sum there was a remainder of 7, and the inspector wished to know how much each boy would have if those 7 oranges were divided among them.

Mental Arithmetic—

1. How many pence are there in a shilling?
2. Give another name for 12.
3. What is the difference between a dozen and a score?
4. How many dozen are there in 144?
5. How much is 144d.?
6. How many score are there in 144?
7. How many are there over?
8. What would a dozen buns cost at 2 a penny?
9. Take 35 from 70 and divide the remainder by 5.
10. Divide 64 nuts among 4 boys.
11. What would be required to give 96 boys a penny each?
12. How much would a boy have left after buying ½ lb. of soap at 7d. per lb., and 1 dozen boxes at ½d. each, out of 3s.?

Geography.—Diagrams were drawn on the board.

1. Which boy has seen a hill?
2. How did you know it was a hill?
3. If it was above a thousand feet high, what was it?
4. What is a valley?
5. How can you tell which way is uphill in a valley?
6. What is a small valley called?
7. Why does a river get wider?
8. Why deeper?
9. Where do rivers run to?
10. What is the place where the river starts?
11. What is the name of the place where water comes out of the earth?
12. How does the water get into the earth?
13. Why does it come through the side?
14. Why is it that the water does not work lower and lower?
15. Where do trees grow best?
16. What is the place called where the sea washes the land?
17. Why is the coast crooked?
18. Why is it not straight?
19. What is a cape?
20. Give other names for cape.
21. What does naze mean?
22. Definitions of the following were asked:—Gulf, bay, peninsula, isthmus, island, strait, channel, ocean.

Grammar.—The class were required to pick out the nouns and verbs from the following—

I had a nice dog. He was a very nice fellow. I was fond of him. The cows are being driven to the meadows. They nibble the fresh green grass.

Sentences were required with the word *milk* as a noun and as a verb.

Recitation.—Every fourth boy was asked to say a verse. Meanings were taken thoroughly.

Standards I. and II.

Singing.—Modulator test by Inspector, which was taken quickly:—

d n r s f n s l t d' n d' f 1 d

A song was then taken.

Standard III.

The class was divided into three equal parts. One part took *Reading*, the other *Writing*, and the third *Arithmetic*.

Reading was taken from the Historical Books.

Writing.—The monkeys gather round him, very curious to find out what the man is doing. The native pretends to take not the slightest notice of them, but goes on hollowing out the nut. When he has finished his task he puts into the cocoanut, through the small opening he has made, a quantity of rice.

Arithmetic—

(*a*) (1) £78,200 14s. 7d. — £29,006 17s. 5¾d.
(2) £789 13s. 2½d. + £92 4s. 5d. + 7½d. + £9,084 12s. 6½d. + £827 17s. 11¾d.
(3) 189,637 ÷ 839.
(4) If 77,607 marbles were equally divided among 25,863 boys, how many would each receive?

(*b*) (1) £78,209 17s. 6½d. + £381 14s. 2¾d. + £8,964 + 1s. 1½d. + £20,006 13s. 4¾d. + 18s. 5½d.
(2) How many times can 86 be taken from 384,678?
(3) £70,006 13s. 2d — £834 17s. 1¾d.
(4) I gave 19 boys 7 marbles each, and had 62 left, how many had I at first?

(*c*) (1) £3,964 12s. 4½d. + £863 17s. 11¾d. + £859 16s. 11d + £3,864 19s. 2½d. + £182 2s. 4d.
(2) £396 1s. 10d. — £249 16s. 2½d.

(3) 865,941 ÷ 387.

(4) What number multiplied by 864 will give the same result as 35,706 × 274.

Mental Arithmetic—

1. How many half-crown caps can I get for £1?
2. What will 40 cost?
3. How much is left out of a half-sovereign after spending 2s. 7½d., 3s. 1d., and 2½d.?
4. How many sixpences are there in a guinea?
5. How many are there in 8 guineas.
6. How many halfpennies are there in a half-crown?
7. How many lbs. of apples at ½d. a lb. can I get for a half-crown?
8. How many lbs. can I get at 2½d. a lb?
9. How many lbs. at ½d. a lb. can I get for 12lbs at 2½d.?
10. What change shall I receive out of a guinea after spending 13s. 4½d.?

Geography—

Teacher questioned the class on Yorkshire, Lancashire, Black Country, and South Coast.

Inspector: 1. What is the port for Sheffield?

2. What do they bring into Hull?
3. Tell me another port on the Humber.
4. What are the two large things that rush through the Humber?
5. What county is Plinlimmon in?
6. What is it?
7. What comes from Plinlimmon?
8. Which counties does the Severn flow through?
9. Tell me a river flowing into the Severn on the left bank
10. What great man used to live on the banks of the Avon?
11. What was he?
12. What does the word Avon mean?
13. What shall we find at the mouth of Severn?
14. What is the Wye noted for?

Grammar—

1. Little Jack Horner sat in a corner
   Eating a Christmas pie,
   He put in his thumb and pulled out a plum, and said
   What a good boy am I!
2. When shall we three meet again?

The children picked out the parts of speech in the above passages.

What is a noun? What parts of speech must we always have in a sentence?

What part of speech is that, that never goes a walk by itself, but always takes another with it? (Auxiliary Verb.) What is an Adjective? What does the word mean? Spell pronoun *their*. Spell another pronoun that can be used instead of their (them).

Recitation.—Several boys said a verse, and the whole class said the last verse altogether.

Meanings were asked.

STANDARDS III. AND IV.

Singing.

Modulator Test—

d n s d' ta l se l t d' s fe f n d n r f l d' s n s d.

Time Test—

1 : 1 : 1.1	1 : — : 1.1	1 : : 1	1 : 1.1 : —	1 : 1 : —
1 : —	— : 1.1	1 :	1 : 1	1 : —	1.1 : 1	1 : — : 1 : 1

Ear Tests—

d' s l ; l f r ; l t r' d' ; f r m.

The Inspector sang a song, and asked the children what measure it was written in.

The children finished by singing a song.

STANDARD IV.

Reading.—The class was divided into three divisions. The division that was examined in reading took their reading from the Historical Reader and the Oriel Reader (the class book). The meanings were thoroughly taken, and questions were asked as to the uses of pictures in reading-books.

Writing.—The dictation was an unseen piece and very difficult, and it was dictated once by the Inspector.

Arithmetic—

(1) Reduce 1,000,000 sq. ft. to poles.

Ans. 3,673 pls., 2¾ yds., 1 sq. ft.

(2) If I buy pears at 1¾d. each, how much money shall I have left out of £1 0s. 1d., and how many pears shall I get?

Ans. 137 pears and 1¼d. left.

(3) £189 16s. 3½d. × 224. Ans. £42,518 9s. 4d.

(4) If there were 22 trees in a row, and each tree 25 yards apart, how far is it from the first tree to the last?

Ans. = 525 yds.

Mental Arithmetic.—The class was taken by the teacher, and a few questions were asked by the inspector:—

(1) If I buy 7 lbs. of veal at 9½d. per lb., what shall I have left out of 10s.?

(2) Take a third of a crown from ⅓ of £1.

(3) Take a sixth of £1 from ⅓ of £1.

(4) Substract them as fractions.

(5) Suppose I divide an apple into seven parts, what shall I call one part?

(6) Now take half of that.

Geography.—The whole of the class was taken by the teacher in British North America and Scotland. The Inspector asked a few questions on Ireland:—

(1) What was the centre of Ireland once?
(2) How do we know it was?
(3) What do they do with it?
(4) Where do the mountains occur in this country?
(5) Which is the commercial town of the north?
(6) Has Ireland many good harbours?
(7) Where would they be more convenient?
(8) Why?

Grammar—

Sentences: 'We lifted him on his saddle again.'
'Sweet and sparkling is every drop.'

The above sentences were analysed and parsed orally. The whole of the class was taken.

(1) What is the Subject? Predicate? Extension?
(2) What case is 'we'? Why?
(3) What is the case of 'his'?
(4) Is it always so?
(5) What is the word in this sentence that appears again, only in a different form?
(6) Why?
(7) What part of speech is 'again'?
(8) Why do you like to see such words as 'on' in a sentence?
(9) What is the subject in the second sentence?
(10) Parse 'is.'
(11) What is there peculiar about 'is'?

Recitation.—Several boys were asked a verse, and now and then the class were asked to say a verse simultaneously. Questions were asked as it was said.

STANDARD V.

Reading.—A third of the class read.

Writing.—Another third of the class was divided into two parts, half taking dictation, and the remainder composition. The dictation was a very difficult unseen piece.

The following was the composition:—

A Boy who writes with his mouth.

A boy one day was working in a colliery. He was driving one of the pit ponies attached to a waggon, and found that the brake was not in working order. An accident happened near a man-hole in which he lost his arms. He is now a clerk, writing with his mouth

Arithmetic—

1. If A had $\frac{2}{10}$, B $\frac{1}{4}$, and C the remainder, how much of an estate would C have?
2. A shopkeeper bought 12 lbs. of sugar at 3½d. per lb., and 16 lbs. of oatmeal at 2½d. per lb. He sold the oatmeal at 1¾d. per lb. At what price per lb. must he sell the sugar so as not to lose or gain anything?
3. Find the value of 186 bushels at 6s. 7¾d. per bushel.
4. $1 - \frac{1}{2} + \frac{1}{3} + \frac{1}{4}$.

STANDARD VI.

Reading.—The whole of this standard read from un unseen reader.

Writing.—Half the class took this subject. The following were the subjects for composition :—

Cricket, Birds' Eggs, Work and Play, Our Museum, Football, Industry, Sharks and their ways, Early Rising.

Arithmetic.—Half the class took this subject.

1. Find the simple interest on £450 at 4 per cent. for 292 days.
2. 1·01 × ·01 ÷ 5·05.
3. Find the difference in ozs. between $\frac{3}{4}$ of a lb. and $\frac{11}{14}$ of a ton.
4. A bicyclist travelled from York to London, a distance of 197 miles, in 18 hours and 28 minutes. How many miles did he go in an hour?

STANDARDS V. AND VI.

Mental Arithmetic—

1. There were nineteen boys. The first had 1s., the second 2s., the third 3s., and so on. What was the total amount given away?
2. Which is the greater, ·6 or $\dot{6}$?
3. What is the difference?
4. Which is the greater, ·25 or ·250?
5. Which is the greater, $\frac{1}{3}$ or $\frac{1}{4}$?
6. What is the difference?
7. Forty-one boys had $\frac{1}{4}$ of an orange each. How many oranges were cut up?
8. What is the difference between ·125 and ·25?
9. What is the cost of thirty articles at 3s. 4d. each?
10. What is the cost at 2s. 6d. each?
11. What is the cost at 17s. 6d. each?
12. A man bought 1,000 oranges at 4 a penny; 250 were bad, and he sold the remainder so as neither to gain or lose. At what price per dozen did he sell them?

Geography.—Maps—Australia, Cape Colony, India.

Questions were given on Canada, Australia, and India. Some of them were—

1. What sea in Europe is similar to Hudson's Bay?
2. Why did the Indians burn the prairies?
3. Give the towns and districts through which the Canadian Pacific Railway passes.
4. What is the capital of Manitoba?
5. What is the derivation of Montreal and Quebec?
6. Give the capital of Canada.
7. Name the lakes.
8. Are the lakes nearly the same level?
9. How do you know they are not? (By the Falls of Niagara.)
10. What was the interior of Australia once?
11. How is salt separated from salt-water?
12. What is the greatest fire you have ever seen?
13. What is the effect of the sun's rays?
14. Give the names of the animals and birds of Australia?
15. What are their sizes and habits?
16. Names of persons who have crossed Australia?
17. What is the richest part of Australia?
18. What is the oldest colony?
19. What are the rivers of India?
20. What is the general shape of India?
21. How do the Hindoos differ from the Europeans?
22. Questions were given on the monsoons and their effect on vegetation.

Grammar.—Preliminary questions—

What do you call that passing through my mind?

What is it if committed to paper?

Questions were given upon prose writers and authors.

Sentences for Analysis and Parsing—

1. Arise, and take again thine own the scenes for ever gone from view.
2. Whatever height to the giant we give,
   He cannot without equal thickness live.

Recitation.—Boys were called upon to say the piece, and then the class were questioned thoroughly upon it.

Singing.—Modulator Test—

d r m s r f s fe s d' ta l r' d'.

Ear Tests—

d r l s; d r m s d; l se l f; r m l t d.

Time Tests.—Inspector sung a refrain and asked the time.

Song Test.—A song was taken in three parts.

CONVERSATIONAL SCIENCE LESSONS.

BY DR. ROBERT STEELE, B.Sc., F.C.S.

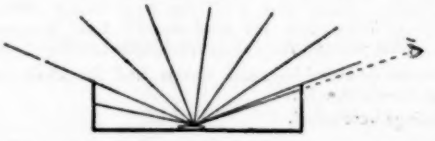
LESSON XXI.—A POND.

A LESSON IN REFRACTION.

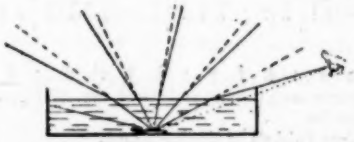
Summary.—Light moves in straight lines. When it leaves one substance and enters another, it turns aside. The reason why a pond looks not so deep as it is, and why a stick appears bent in water.

Materials.—A dish, water, a coin, a ruler. (If the class is seated on the level, a shallow dish should be used, *e.g.*, a pie-dish, but if the back rows are raised, it will be necessary to have one somewhat deeper.)

Introduction.—Recapitulate lessons 12 and 13. Draw attention especially to these points :—All daylight comes from the sun. Light moves in straight lines. We see things because rays of light come from them to our eyes in a straight line. We see this coin because there is nothing between it and our eyes. If it is put into a dish we cannot see it. Why? Because the sides of the dish are in our way. The rays of light cannot pass through them. Draw a diagram on the board, thus :—



I. Arrange the coin so that it just cannot be seen by anyone in the class. Pour a little water into the dish. The coin will come into view as it is poured in. The coin has not been moved, yet the light from it now reaches the eye. The rays of light must therefore have been bent somewhere. Draw a diagram on the board thus :—



II. If we look at the bottom of the dish after water has been poured in, it seems that the whole bottom has been raised. The dish seems shallower. This is

because the rays from the bottom are bent down as they come out. The eye is used to light travelling only in *straight* lines, and hence sees the bottom higher up. Draw this diagram on the board which

shows a ray of light from an object on the bottom, and also the place where the eye sees the object. This explains why a pond always seems shallower than it is.

III. If we put a stick partly into the water it appears bent at the place where it leaves the water. The rays of light that come from the part of the stick in the water are bent down as they leave the water. Hence that part of the stick appears bent up. Illustrate this by putting a ruler into water at an angle of 45°.

IV. If any of the class can swim elicit that we can see in water just as correctly as in air. Light moves in straight lines *in* water as in air.

Recapitulate.

Lesson XXII.—A Burning Glass.

Summary.—When sunlight passes through a prism it is bent round towards the thick part of the prism. A lens gathers the sun's light and heat that fall on it into one bright point called the focus of the lens.

Materials.—Prism, magnifying-glasses. (A larger reading-glass, and two or three smaller ones, like the botanical lenses used, would be sufficient. Convex spectacle glasses may be used. The lesson must be given in a room into which the sun is shining.)

Introduction.—Recapitulate last lesson. Write on the board: 'When light passes from one substance to another it changes its direction.'

I. Hold the prism in the sunlight with its flat face uppermost. Arrange that the spectrum falls on a wall or sheet of paper on which the sunlight does not fall. The class will observe that the prism bends the sunbeam out of its course. Point out, by questioning, the direction in which the bending takes place. Turn the prism flat face downwards; show the position of the spectrum. Write on the board: 'A prism turns the rays of light towards its thicker parts.'

II. Hold up to the class a magnifying-glass, as large as can be obtained. Let the class describe its shape, material, etc. It is made of glass, round, thin at the edges, thick in the middle. Hold it up in the sunlight, with a sheet of paper behind it, slanted so that the class can see it. Question for a description. There is a sort of shadow of the glass with a bright ring in the middle. By moving the lens the bright ring becomes smaller or larger. Bring out that the reason of the shadow is that all the light that fell on the lens is in the bright ring. Write on the board: 'A lens gathers the light that falls on it into one bright spot.'

III. Let us examine the properties of this spot. Move the lens to and fro until the spot is as small as possible. As it gets smaller it gets brighter. Let the class observe this and find the reason; because there is the same amount of light on a much smaller space. Take a small piece of tissue paper. Let a child hold it (in a penholder) at this spot. Call the spot the 'focus' of the lens. In a short time the paper will blacken and burn. Repeat the experiment with a piece of string, tinder, etc., if the sun be shining brightly. Show how accidents have happened with globes of water setting fire to curtains, etc. This is why a lens is called a burning glass. Write on the board: 'A lens gathers the light and heat that fall on it into one small spot called the focus.' Question as to where the heat comes from.

IV. Holding up different lenses, point out that each has its own distance of focus.

Recapitulate.

Lesson XXIII.—The Rainbow.

Summary.—A rainbow is seen while the sun is shining on rain. The rain drops act as tiny lustres, throwing back a spectrum. Its shape is round. The colours are those of the spectrum.

Materials.—Prism, drawing of rainbow.

Introduction.—Holding the prism in the sunlight, the teacher will question the class as to its use, and what happens when light passes through it. Handing it round the children are to observe some object, *e.g.*, a window frame, and to notice that it has a coloured edge. They should name the principal colours in order. A spectrum should then be thrown on the screen, and the class asked if they had ever seen anything of those colours without a prism—the rainbow.

I. When is the rainbow seen? During rain. Do we see a rainbow every time it rains? No, only when the sun is shining. Next bring out the point that when we look at a rainbow our back is to the sun. Throw a spectrum on the wall beneath or beside the window at which the sunlight enters. Let a child pass between the window and the prism so as to see the spectrum. Call the prism the shower, and the spectrum the rainbow. Refer to the use of lustres, to break up sunlight into colours, and to throw them about in various directions. The drops of rain act as lustres, and throw the coloured light around.

II. What is the shape of the rainbow? Round. Use the words circular, circle. The shape of the rainbow is a semi-circle. Question on the colours seen. Red, green, and blue are usually given. Point out that all the colours of the spectrum are there. The red is always uppermost. Produce your picture, pointing out these facts.

III. When the sun is shining brightly we sometimes see a second rainbow. Is this near the first? Where is it? Some distance above it, and much fainter. In this one the blue is uppermost, and the red lowest.

IV. Whenever we have a strong light and water broken up into drops we have a rainbow, *e.g.*, in a waterfall, a large fountain, etc.

Recapitulate.

Lesson XXIV.—A Bell.

Summary.—A bell is an instrument for producing sound. When it is sounding its parts are moving. If it cannot move it does not sound. When it is sounding it is striking the air round it.

Materials.—A bell, a tumbler, a wine glass, a small coin.

Introduction.—The teacher, holding up the bell, will question the class as to the use of bells, and the different kinds of bells, bringing out that their object is to make a pleasant sound, to call people's notice to them. The sound must be loud.

I. The children will give, on questioning, the names of the two parts of the bell proper, the gong, and the clapper or hammer. Which is moved in a table bell? The clapper. In a door bell? The

bell. In a church bell? The bell. How is the sound produced? By striking the bell with the clapper. Take up a tumbler and strike it gently with a pencil, a soft sound is produced. Strike it harder, a louder sound is heard. Hold the tumbler sideways in your hand and lay a small coin in it. Strike the tumbler to produce a musical sound. The coin jumps up and down. What made the coin move? The glass was moving. When the glass left off sounding, the coin left off moving; what does this show? That when the glass is sounding it is also moving. Write this on the board. Repeat the experiment.

II. Strike the glass with the clapper, and while it is sounding lay the hand on it. What happens? The sound ceases. Lay the hand on the glass and then strike it. Its sound is not made. Lay the tumbler mouth downward and strike it. Its sound is not made. All these things prevent the sides of the glass from moving, and so prevent the glass from sounding.

III. Lead the class to see that when a bell is struck the sides are pushed inwards. Then the sides come outwards again and strike the air. Then they recoil again, and again come out and strike the air. Illustrate this by letting a pencil fall against a piece of stretched india-rubber. When a bell is sounding it is striking the air, pushing it backwards and forwards. Bring out that the sound comes to us through air.

IV. Put the two glasses side by side. Strike first the larger one and then the wine glass. Which gives the higher sound? The smaller one. Which gives the deeper sound? The tumbler. Write on the board: 'The smaller the glass, the higher the sound.'

Recapitulate.

Lesson XXV.—A Toy Telephone.

Summary.—Sound is carried by solid bodies better than by air.

Materials.—A couple of large pill boxes, some parchment paper (used for covering jam pots), some fine cord. (The teacher would do well to have one already made before the lesson in addition to the one made up in class.)

Introduction.—The teacher will begin by general questioning on last lesson, especially bringing out the points that we can hear well at certain distances, that at others we can only hear loud sounds, and that beyond that we cannot hear sounds at all. From this he will explain that instruments have been made by which we can hear at a distance, and that he is about to make one.

I. The top and bottom of each box are to be carefully removed, leaving the sides uninjured. A piece of parchment paper is to be stretched over what was the mouth of the box, and the sides of the lid are to be slipped over this, holding the drumhead tight. The lid and paper are then fastened down with thread. One end of the cord is to be passed through the centre of each drumhead and secured round a bent pin. The cord is then pulled until the pin lies flat on the inside of the drumhead. The telephone is then complete.

II. Place two children at such a distance from each other that the cord is lightly stretched. Let one whisper into it, while the other holds it to the ear. The whisper will be heard, though a child standing by cannot hear it. The teacher will now recapitulate part of last lesson, bringing out in this order that the bell produced sound, that they heard the sound, and therefore that the sound must have travelled from the bell to them, and that there was only one thing between them and the bell—the air. The class will notice that if one child whispers towards the other without the telephone the whisper cannot be heard, because the sound is not loud enough to be heard through the air. When one whispers into the drum and the other listens at his drum he *can* hear. Bring out from the class that the sound has travelled *not* through the air, but through the cord.

III. The teacher will now show other experiments to prove that sound can travel through wood, iron, etc. If long desks are in use a gentle scratch at one end cannot be heard at the other unless the head touches the desk, when the sound comes through the wood. A map-hook may be used for this experiment, the teacher holding one end and resting it against a desk. In some places people hold a poker to a kettle to hear whether it has begun to boil, one end resting on the kettle and the other touching the head. Knockings on a wall are heard all over it, etc. Write on the board: 'Sound is carried by solid bodies—such as string, wood, iron, stone—better than by air.'

Recapitulate.

Lesson XXVI.—A Tuning Fork.

Summary.—A tuning fork produces one kind of sound when struck, hence its use. The tuning fork moves while it is sounding. It does not sound when it cannot move. The smaller the fork the higher the sound.

Materials.—Tuning Forks, A and C. Poker.

Introduction.—Recapitulate lesson 24. A bell produces sound while its parts are moving. When its parts are prevented from moving it does not produce sound.

I. Hold up the poker by one end and tap it with a pencil. Let the class notice the sound. Hold it in the middle and tap it in the same place as before (about one-sixth of the length from the end is the best place).

The same sound is produced. Tap the other end of the poker. The same sound is still produced. Let one child lay a finger on the poker very gently while it is being tapped. It will feel the poker moving very quickly.

II. Take up one of the forks, and show the class that it is like an iron bar bent in the middle, and fitted with a handle. When we strike it, it gives out the same sound, whichever prong is struck. Call out a child and let it touch the fork gently while it is sounding; it will feel the jar. Write on the board: 'The tuning fork moves while it is sounding.' Let another child put its hand firmly on a sounding tuning fork. It prevents the fork moving, and stops the sound. Write: 'The fork does not sound when it cannot move.'

III. Refer to bells; remind the class of the difference between large and small bells. A smaller bell gives a higher note. Sound the two forks. Which is the larger fork? Which gives the higher note? Write on the board: 'The smaller the fork the higher the sound.'

IV. Sound one of the forks again. Make the class notice that every time it has been sounded it gives the same note. Bring out the use of this in singing. We can start from the same note every time we sing a piece of music.

V. Emphasize the distinction between loud and soft, high and low sounds.

Recapitulate.

(To be continued.)

LA JEUNE SIBÉRIENNE.

TRANSLATED BY PROFESSOR DARQUÉ—*(Author of 'Pupil Teachers' French Course.')*

Sa femme le priait un matin d'aller prendre quelques pommes de terre[147] dans un petit jardin qu'il cultivait près de la maison. Immobile et plein de ces tristes idées, il paraissait ne faire aucune attention à cette demande ; enfin, revenant tout à coup à lui : 'Allons, dit-il comme pour s'encourager, aide-toi, je t'aiderai !'[148] En achevant ces mots, il prit une bèche et se rendit au jardin. Prascovie le suivit. 'Sans doute, mon père, il faut s'aider[149] dans le malheur, et j'espère aussi que Dieu m'aidera dans la prière que je viens vous faire, et qu'il touchera votre cœur. Rendez-moi le passeport, cher et malheureux père ! Croyez[150] que c'est la volonté de Dieu. Voulez-vous forcer votre fille à l'horrible malheur de vous désobéir ?' En parlant ainsi, Prascovie embrassait ses genoux et tâchait de lui inspirer la même confiance qui l'animait. La mère survint. Sa fille la conjura de l'aider à fléchir son père ; la bonne femme ne put s'y résoudre. Elle avait eu la force de consentir au départ, mais elle n'avait point le courage de le demander. Cependant Lopouloff ne put résister plus longtemps à de si touchantes sollicitations : il savait d'ailleurs sa fille si décidée, qu'il craignait de la voir[151] partir sans passeport. 'Que faire[152] avec cette enfant ? s'écria-t-il. Il faudra bien la laisser partir !' Prascovie, transportée de joie, s'élança au cou[153] de son père. 'Soyez sûr, lui disait-elle en l'accablant des plus tendres caresses, que vous ne vous repentirez point de m'avoir écoutée : j'irai, mon père, oui, j'irai à Saint-Petersbourg ; je me jetterai aux pieds de l'empereur, et cette même Providence qui m'en inspira la pensée et qui a touché votre cœur voudra bien aussi disposer celui de notre grand monarque en votre faveur.'

'Hélas ! lui répondit son père en versant des larmes, crois-tu,[154] pauvre enfant, que l'on puisse parler à l'empereur comme tu parles à ton père en Sibérie ? Des sentinelles gardent de toutes parts les avenues de son palais, et tu ne pourras jamais en passer le seuil.[155] Pauvre et mendiante, sans habits, sans recommandations, comment oseras-tu paraître, et qui daignera te présenter ?'

Prascovie sentait la force de ces observations, sans en être découragée : un pressentiment secret l'emportait[156] sur tous les raisonnements. 'Je conçois les craintes que vous inspire votre tendresse pour moi, répondit-elle ; mais que de motifs n'ai-je pas d'espérer ! Réfléchissez, de grâce ![157] Voyez de combien de faveurs inespérées Dieu m'a déjà comblée, parce que j'avais mis toute ma confiance en lui ! Je ne savais comment avoir un passeport, il a forcé la bouche de l'incrédule à m'indiquer les moyens de

His wife was asking him one morning to go and dig a few potatoes in a little garden which he cultivated near his house. Motionless and full of those sad thoughts, he seemed to pay no attention to that request ; at last recovering himself all at once : 'Come,' he said, as if to encourage himself, 'help thyself, I shall help thee !' Having spoken those words, he took a spade and went to the garden. Prascovie followed him. 'Doubtless, father, one must help oneself in misfortune, and I also hope that God will help me in the prayer that I address to you, and that He will move your heart. Give me back the passport, dear and unfortunate father ! Be assured that it is the will of God. Do you want to drive your daughter to the unfortunate necessity of disobeying you ?' While talking thus, Prascovie was embracing his knees and endeavouring to impart to him the same confidence which inspired her. The mother came in the meanwhile. Her daughter entreated her to help her to persuade her father ; the good woman could not make up her mind to do so. She had had the courage to consent to the departure, but she had not the heart to ask for it. However, Lopouloff could not resist any longer entreaties so moving ; he knew besides that his daughter *was* so decided that he dreaded lest she should start without a passport. 'What shall I do with that child ?' he exclaimed. 'It will indeed be necessary to let her start.' Prascovie, transported with joy, rushed into her father's arms. 'Be assured,' she said to him, while loading him with the most tender caresses, 'that you will not repent having listened to me : I shall go, father, yes, I shall go to St. Petersburg ; I shall fall at the feet of the emperor, and that same Providence who suggested the thought of it to me, and who has moved your heart, will also kindly dispose that of our great monarch in your favour.'

'Alas !' her father answered her with tearful eyes, 'do you think, poor child, that one may speak to the emperor as you speak to your father in Siberia ? Sentries everywhere guard the gates of his palace, and you will never be able to get admission. Poor and a beggar, without *good* clothes, without recommendations, how will you dare to appear, and who will condescend to introduce you ?'

Prascovie felt the force of those observations without being disheartened thereby ; a secret presentiment outweighed all arguments. 'I understand the fears which your affection for me suggests to you,' she replied, 'but how many reasons have I not to hope ! Reflect, I entreat you ! See how many unexpected favours God has already lavished upon me, because I had put all my trust in Him. I did not know how to get a passport, He compelled the mouth of an unbeliever to point to me

(147) The expressions *bifteck aux pommes*, *pommes frites*, etc., often heard in hôtels and restaurants refer, *not* to apples, but to potatoes.

(148) Everybody knows the proverb : *aide-toi, le ciel t'aidera*, help thyself, Heaven will help thee.

(149) *Il faut s'aider* may mean also 'we must help one another,' and this is most likely what was uppermost in Prascovie's mind.

(150) *Croire* is very frequently rendered by 'to think.' *Croyez-vous qu'il fasse beau temps ?* do you think it will be fine ?

(151) *Craignait de la voir* is more idiomatical, though less emphatic, than *craignait qu'elle ne partît.*

(152) *Que faire* stands here for *que dois-je faire* or *que faut-il faire*, either of which expressions accounts for the use of the infinitive.

(153) *Cou*, literally, 'neck' : *s'élança au cou de son père* may be more literally rendered by 'fell on her father's neck.

(154) *Crois tu. Croire* may here indifferently be rendered by either 'to believe' or 'to think.'

(155) *Passer le seuil*, literally, 'cross the threshold.'

(156) *L'emportait*, 'triumphed,' a Latinism of frequent occurrence.

(157) *De grâce.* 'Pray' has the same meaning, but is less emphatic.

l'obtenir ; c'est lui qui a fléchi l'inexorable gouverneur de Tobolsk. Enfin, malgré votre invincible répugnance, ne vous a-t-il pas forcé vous-même à m'accorder la permission de partir ? Soyez donc certain, ajouta-t-elle, que cette Providence qui m'a fait surmonter tant d'obstacles, et qui m'a si visiblement protégée jusqu'ici, saura[158] me conduire aux pieds de notre empereur. Elle mettra dans ma bouche les paroles qui doivent le persuader,[159] et votre liberté sera la récompense du consentement que vous m'accordez.'

Dès cet instant le départ de la jeune fille fut décidé, mais on n'en détermina point encore l'époque précise. Lopouloff espérait tirer quelques secours de ses amis : plusieurs prisonniers avaient des moyens[160] ; quelques-uns même lui avaient fait, en d'autres occasions, des offres que sa discrétion ne lui avait pas permis d'accepter ; mais en cette occasion il se proposait d'en profiter. Il désirait aussi trouver quelque voyageur qui pût[161] accompagner sa fille pendant les premières marches.[162] Il fut trompé dans cette double attente. Cependant Prascovie pressait son départ. Toute la fortune de la famille consistait dans un rouble en argent.[163] Après avoir vainement tenté d'augmenter cette modique somme, on fixa le jour de la cruelle séparation, d'après[164] le désir de la voyageuse, au 8 septembre, jour d'une fête de la Vierge.[165] Aussitôt que la nouvelle s'en répandit dans le village, toutes leurs connaissances vinrent la voir, poussées par la curiosité plutôt[166] que par un véritable intérêt. Au lieu de l'aider ou de l'encourager dans son entreprise, on désapprouva généralement son père de lui avoir accordé la permission de partir. Ceux qui auraient pu lui donner quelques secours parlèrent des circonstances malheureuses qui empêchent souvent les meilleurs amis de se rendre service au besoin[167] ; et au lieu de l'assistance et des consolations que la famille en attendait, ils ne lui laissèrent en la quittant que de sinistres présages. Cependant deux des plus pauvres et des plus obscurs prisonniers prirent la défense de Prascovie et l'encouragèrent par leurs conseils. 'On a vu, disaient-ils, des choses plus difficiles réussir contre toute espérance. Sans parvenir elle-même jusqu'au souverain,[168] elle trouvera des protecteurs qui parleront pour elle, lorsqu'on la connaîtra et qu'on l'aimera comme nous.' Le 8 septembre, à l'aube du jour, ces deux hommes revinrent pour prendre congé[169] d'elle et pour assister à son départ. Ils la trouvèrent déjà toute[170] disposée pour le grand voyage, et chargée[171] d'un sac qu'elle avait préparé depuis longtemps. Son père lui remit le rouble qu'il lui destinait, mais qu'elle ne voulait point accepter ; elle représentait que cette petite somme ne pouvait pas la conduire jusqu'à Saint-Pétersbourg, tandis qu'elle pouvait leur devenir nécessaire. Un ordre absolu de son père put seul la lui faire accepter. Les deux pauvres exilés

the means of obtaining it ; it is He who has moved the inexorable governor of Tobolsk. Lastly, in spite of your unconquerable repugnance, has He not compelled you to grant me yourself permission to start ? You may then be sure,' she added, 'that that Providence which enabled me to overcome so many obstacles, and which so evidently protected me till now, will be able to lead me to the feet of the emperor. Providence will inspire me the words that are to persuade him, and your liberty will be the reward of the consent which you grant me.'

From that moment the departure of the young girl was decided on, but the precise time was not yet fixed. Lopouloff hoped to draw some pecuniary assistance from his friends. Several prisoners had means ; a few even had, on other occasions, made him offers which his discretion had not allowed him to accept; but on this occasion he intended availing himself of them. He also wished to find some traveller who might accompany his daughter during the first days of her journey. He was disappointed in this double expectation. Meanwhile Prascovie was hastening her departure. The whole fortune of the family consisted of one silver rouble. After having vainly tried to increase that slender sum, the day of the cruel parting was, according to the desire of the traveller, fixed for the 8th of September, one of the feasts of the Virgin. As soon as the news of it was spread in the village, all their acquaintances came to see her, urged by curiosity rather than real interest *in her welfare*. Instead of helping or encouraging her in her undertaking, they generally disapproved her father for having given her permission to go. Those who might have given her some assistance spoke of unfortunate circumstances which often prevent the best friends obliging one another in case of need ; and instead of the help and comforting words which the family expected from them, they only left, on going, sinister forebodings. Yet two of the poorest and most obscure prisoners took Prascovie's part, and encouraged her by their advice. 'People have seen,' they said, 'more difficult things succeed against all hope. Without obtaining admittance to the sovereign's presence, she will find protectors, who will speak for her when they know and love her as we do.' On the 8th of September, at daybreak, those two men came again to take leave of her and be present at her departure. They found her already quite prepared for the long journey, and laden with a bag, which she had got ready a long time before. Her father gave her the rouble which he intended for her, but which she was not willing to accept ; she showed that that small sum could not take her to St. Petersburg, whereas they might want it. An absolute command from her father could alone make her accept it. The two poor exiles also wished to contribute to the little capital which she took with her

(158) *Saura*. Here is another instance of the verb *savoir* used instead of *pouvoir*. *Saura* may, however, be rendered by 'will know how.'

(159) *Doivent le persuader* is quite as emphatic as its equivalent, *ne peuvent manquer de le persuader*, cannot fail to persuade him.

(160) *Moyens*, here 'money.'

(161) *Pût*. The subjunctive plainly shows how doubtful this was.

(162) *Marche* is here synonymous with *un jour de marche*, a day's journey.

(163) *Un rouble* is worth about three shillings.

(164) *D'après* is synonymous with *selon* or *suivant*.

(165) The nativity of the Holy Virgin Mary.

(166) Do not mistake *plutôt*, in preference, for *plus tôt*, sooner, in point of time.

(167) *Au besoin*, i.e., *en cas de besoin*.

(168) *Parvenir jusqu'au souverain*, to get admittance to the presence of the sovereign. Notice : *parvenir à faire une chose*, to succeed in doing a thing.

(169) *Congé*, of soldiers and sailors, furlough ; of school children, holiday.

(170) *Toute*, though an adverb, agrees in gender and number with the adjective immediately following when the latter is in the feminine and begins with a consonant or *h* aspirated.

(171) Observe *une lettre chargée*, a registered letter.

voulurent aussi contribuer au petit fonds qu'elle emportait pour le voyage; l'un offrit trente kopecks en cuivre, et l'autre une pièce de vingt kopecks en argent; c'était leur subsistance de plusieurs jours. Prascovie refusa leur offre généreuse, mais elle en fut vivement touchée: 'Si la Providence, leur dit-elle, accorde jamais quelque faveur à mes parents, j'espère que vous en aurez une part.'[172]

Dans ce moment, les premiers rayons du soleil levant parurent dans la chambre. 'L'heure est venue, dit-elle; il faut nous séparer.'[173] Elle s'assit ainsi que ses parents et les deux amis, comme il est d'usage en Russie en pareille circonstance. Lorsqu'un ami part pour un voyage de long cours,[174] au moment de faire les derniers adieux, le voyageur s'assied; toutes les personnes présentes doivent l'imiter; après une minute de repos, pendant laquelle on parle du temps et de choses indifférentes, on se lève, et les pleurs et les embrassements commencent.

Cette cérémonie, qui au premier coup d'œil[175] paraît insignifiante, a cependant quelque chose d'intéressant. Avant de se séparer pour longtemps, peut-être pour toujours, on se repose encore quelques moments ensemble, comme si l'on voulait tromper la destinée et lui dérober cette courte jouissance.

Prascovie reçut à genoux[176] la bénédiction de ses parents, et, s'arrachant courageusement de leurs bras, quitta pour toujours la chaumière qui lui avait servi de prison depuis son enfance. Les deux exilés l'accompagnèrent pendant la première verste.[177] Le père et la mère, immobiles sur le seuil de la porte, la suivirent longtemps des yeux, voulant lui donner de loin un dernier adieu; mais la jeune fille ne regarda plus en arrière, et disparut bientôt dans l'éloignement.

Lopouloff et sa femme rentrèrent alors dans leur triste demeure, qui désormais allait leur paraître bien déserte. Les malheureux vécurent encore plus isolés qu'auparavant: les autres habitants d'Ischim accusaient le père d'avoir lui-même poussé sa fille à cette imprudente entreprise, et le tournaient en ridicule[178] à ce sujet. On se moquait surtout des deux prisonniers, qui, dans leur simplicité, n'avaient pas caché[179] la promesse que Prascovie leur avait faite de s'intéresser à eux,[180] et on les félicitait d'avance sur leur bonne fortune.

Laissons maintenant cette région de peines et suivons notre intéressante voyageuse. Lorsque les deux amis qui l'avaient accompagnée la quittèrent, elle avait trouvé plusieurs jeunes filles qui faisaient la même route[181] qu'elle jusqu'au village voisin, éloigné d'Ischim d'environ vingt-cinq verstes. Chemin faisant,[182] elles furent accostées par une bande de jeunes paysans dont quelques-uns étaient à moitié ivres; ils descendirent de cheval,[183] sous prétexte de les accompagner: c'était à l'entrée d'un grand bois. Les voyageuses alarmées

for her journey; one offered her thirty kopecks in copper coins, and the other a silver coin worth twenty kopecks; it was what they had to live on for several days. Prascovie refused their generous offer, but she was deeply moved by it. 'If Providence,' she said to them, 'ever grants any favour to my parents, I hope you will have some share in it.'

At that moment the first rays of the rising sun entered the room. 'The hour has come,' she said; 'we must part.' She sat down, as well as her parents and the two friends, as is the custom in Russia in such circumstances. When a friend starts on a long journey, at the moment of saying a last farewell, the traveller sits down; all the people present must do the same;' after a minute of rest, during which they talk of the weather and indifferent things, they rise, and the tears and embraces begin.

This ceremony, which at first sight appears insignificant, offers, nevertheless, something interesting. Before parting for a long time, perhaps for ever, people rest again for a few moments together, as if they wanted to deceive fate and snatch from it this short enjoyment.

Prascovie received on her knees the blessing of her parents, and courageously tearing herself from their arms, left for ever the cottage which had been a prison to her from her infancy. The two exiles accompanied her during the first verst. The father and mother, motionless on the door-step, followed her a long time with their eyes, wishing to give her from afar a last farewell; but the young girl no longer looked back, and soon disappeared in the distance.

Lopouloff and his wife then re-entered their sad abode, which henceforth was going to appear very lonely to them. The unfortunate ones lived still more isolated than before; the other inhabitants of Ischim accused the father of having himself urged his daughter to *undertake* that imprudent enterprise, and made sport of him on that account. They laughed especially at the two prisoners, who, in their simplicity, had not kept to themselves the promise which Prascovie had made to them to speak in their favour, and they congratulated them beforehand on their good luck.

Let us now leave that region of grief and follow our interesting traveller. When the two friends who had accompanied her parted from her, she had found several young girls who were going the same way as herself as far as the next village, about twenty-five versts distant from Ischim. On the way they were met by a band of young peasants, some of whom were half-tipsy; they dismounted, under pretence of accompanying them: it was at the entrance of a large wood. The girls, alarmed, would not go that way with

(172) Beware of the idiomatic uses of *part*, as they are of frequent occurrence.

(173) *Séparer* is another of those transitive verbs which always governs a direct object: hence the reflective form.

(174) *Voyage de long cours* is chiefly said in reference to long sea voyages. The modern expression is *voyage au long cours*.

(175) *Coup d'œil*, literally 'glance.' Notice: *coup de pied*, a kick; *coup de poing*, a cuff; *coup de langue*, a slander; *coup de tête*, a mad trick; *coup de sang*, an apoplectic stroke; *coup de soleil*, a sun stroke; *coup de couteau*, a stab; *coup de fusil*, a (gun) shot, and ever so many more such idiomatical expressions.

(176) Compare *à genoux*, on one's knees; *à pied*, on foot; *à cheval*, on horse-back; *en voiture*, in a carriage; *en bateau*, in a boat.

(177) The verst is a measure of length equal to 1,177 yards, or rather more than three-fifths of a mile.

(178) *Tourner en ridicule*, literally 'to ridicule.'

(179) *Caché*, literally 'hid.'

(180) *S'intéresser à quelqu'un*, to take an interest in some one.

(181) *Route*, literally 'road.'

(182) *Chemin faisant* is equivalent to *en faisant son chemin*. This mode of expression is imitated from the Latin, from which French is almost entirely derived.

(183) *Il descendit à l'auberge*, he put up at the inn; *il descendit de voiture*, he alighted.

ne voulurent point s'y acheminer avec eux : elles avaient quelques provisions, et s'assirent au bord du chemin pour se restaurer, en priant les villageois de continuer leur route ; mais ils s'assirent avec elles, en déclarant vouloir partager leur déjeuner, et les accompagner ensuite jusqu'au village. Dans cette perplexité, Prascovie, pour éloigner ces importuns, crut pouvoir employer une petite ruse, qui lui réussit : 'Nous irions volontiers avec vous, leur dit-elle ; mais nous devons attendre ici mes frères, qui nous amènent des chariots pour nous transporter.' Les jeunes gens virent en effet dans l'éloignement deux chariots que Prascovie avait aperçus avant eux ; bientôt après ils remontèrent à cheval et disparurent. 'C'était un petit mensonge, disait-elle en racontant sa première aventure : mais il ne m'a pas porté malheur.' Elle parvint heureusement au village où elle devait s'arrêter, et logea chez un paysan de sa connaissance qui la traita fort bien.

them : they had some provisions, and sat down by the roadside to take some refreshment, requesting the young men to proceed on their way ; but they sat down with them, saying they would share their breakfast, and afterwards accompany them as far as the village. In this perplexity Prascovie, to send those intruders away, thought she might have recourse to a little trick, which proved successful. 'We would go willingly with you,' she said to them, 'but we must wait here for my brothers, who are bringing carts to carry us.' The young men saw indeed in the distance two conveyances, which Prascovie had perceived before them ; soon afterwards they again mounted their horses and went away. 'It was an innocent falsehood,' she said, when relating her first adventure, 'but it did not bring me any ill-luck.' She reached safely the village where she was to stop, and slept at a peasant's of her acquaintance, who treated her very well.

(To be continued.)

TEACHERS' NOTES OF DRAWING LESSONS FOR STANDARD IV.

By E. BUFFERY RIDGE, *Art Master under the London School Board.*

Freehand for Standard IV.

To get thin lines—depend on lightness of hand, not on sharp pencil points.

Symmetry and Repetition.

1. This figure consists of two flowers and two stalks (looking at the top half of the square only). The flower and stalk on one side balance the flower and stalk on the other side. Because the parts of the drawing are *repeated* in such a way as to *balance* each other, the figure is said to be *symmetrical.*

One flower is symmetrical by itself because one half balances the other half, but one stalk is not ; it wants another stalk turned the opposite way to balance it.

If the figure is copied upside down in the other part of the square, then the top and bottom halves will balance each other.

Clean up nicely when the sketching is finished and line in *lightly*, leaving out all the straight lines ex-

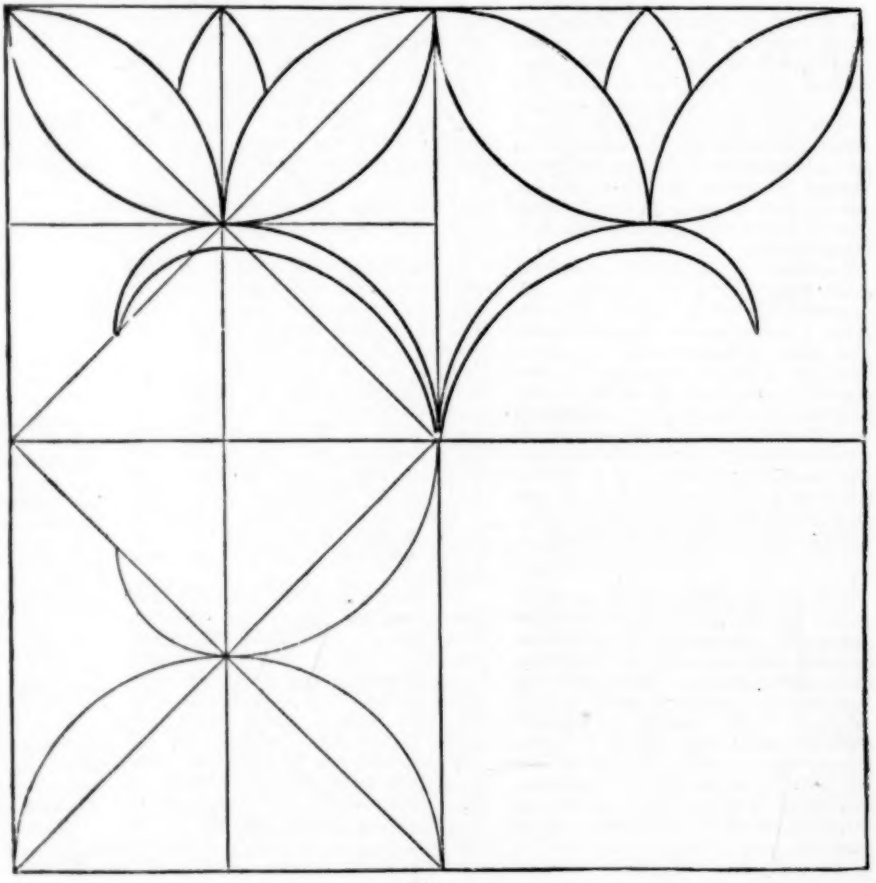


Fig. 1.

cept the four sides of the square. Make all corners and meeting places of lines very neat. The lines should be a little thinner than in Standard III. work.

2. Curves *repeated* in a square, forming a four-sided symmetrical figure.

Be very careful about the crossing places, *a*, *a*, *a*, *a*, placing them all at the same distance from the centre of the square, and be sure to get the space in the middle the same every way, and the four loops all alike. Finish as in No. 1.

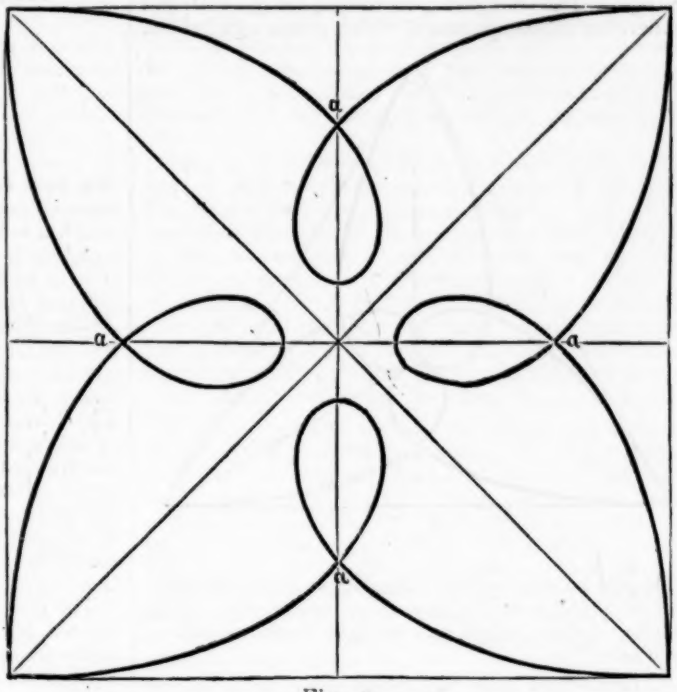


Fig. 2.

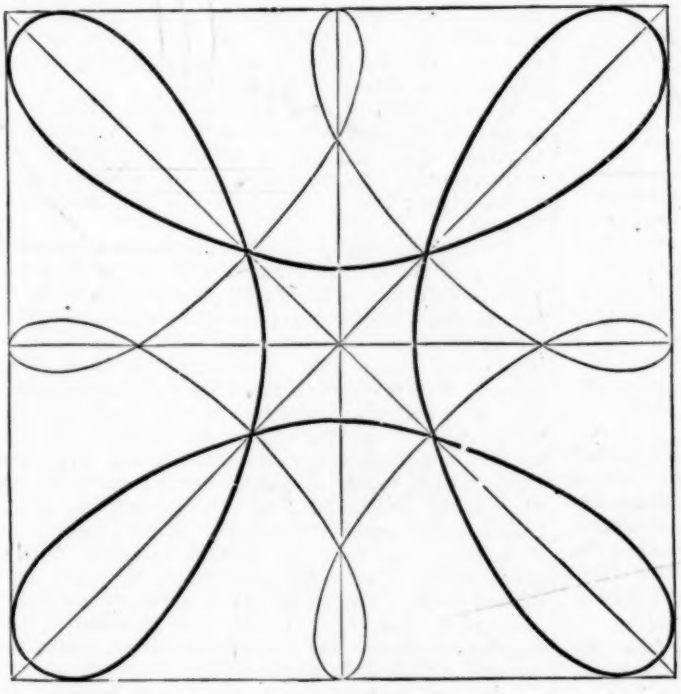


Fig. 3.

3. Another square filled in with curves. This is a little harder than the last, because there are two repeating curves. Draw that with the large loops first and finish it all round the square, then the small loops and the rest of the curves they belong to. Mind the *round ends* of the large loops in the corners of the square.

4. Curves the same as in No. 2, but repeating in a triangle. The triangle has its three sides all equal, and is therefore called equilateral, which means equal-sided.

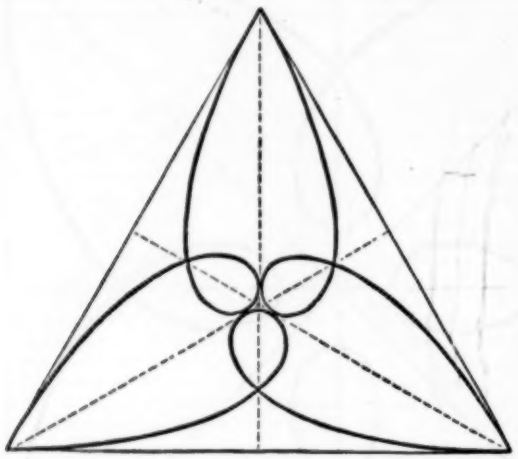


Fig. 4.

Draw the outside and the dotted lines first, very thin, and be careful that the three lines which cross in the middle of the triangle run straight to the *middle of each side*.

5. Equilateral triangle upside down, with curves like those in No. 3.

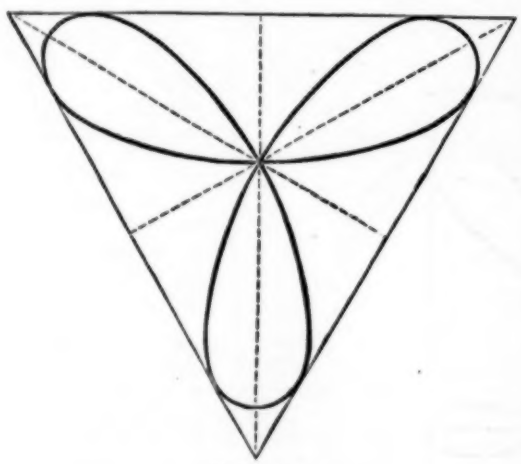


Fig. 5.

6. Get a number of heart-shaped leaves (common plane-tree), and arrange them in a square (fix them on black-board with drawing pins), to form a pattern like No. 2. It will be found that no two leaves are exactly alike, and that no one leaf has both sides exactly alike, but when used as patterns the drawing from them must be made symmetrical. Lilac leaves are equally good for the purpose.

7. Get laurel leaves and pin on board to form No. 5 or No. 3, using two sizes of leaves. Don't draw the stalks.

(*To be continued.*)

ELEMENTARY LESSONS IN AGRICULTURE.

BY PROF. GREEN,

Examiner in Botany to Cambridge University

VII.

The Feeding of the Plant.

We have now seen that every plant is very much influenced during its life by the natural agencies with which it is brought into contact, and we find that its structure is always adapted to the nature of the situation in which it finds itself. Not only so, but when different parts of it are surrounded by different conditions those parts are constituted accordingly. The root, we have seen, is generally found embedded among particles of soil, and its delicate hairs enable it to absorb the moisture which is attached to such particles. The leaves are surrounded by air, which contains moisture and carbon-dioxide, and they are especially constructed to absorb this gas. Both roots and leaves are in contact with oxygen, the former finding it in the air occupying the interspaces between the particles of soil, the latter meeting it freely in the open. Both are by their structure able to absorb it so that respiration can go on in all parts.

The process of absorption of carbon-dioxide, we have learned, is to be connected in our minds with the feed- of the plant. Let us now examine a little more fully what is the manner of this feeding. We must notice three things: 1st. The carbon-dioxide must be allowed to get freely to certain parts of the plant; 2nd. These parts must be green parts, such as leaves, and very young stems; 3rd. There must be a certain amount of sunlight obtaining access to the plant. To these three requirements we must add also two other stipulations. The temperature must be within certain limits, and there must be present in the plant a small amount of iron. When a plant is vigorously growing we find that all these conditions are fulfilled.

We will examine then a plant placed under these favourable circumstances, and see whether we can learn anything about the way in which it transforms the carbon-dioxide into substances which specially belong to the plant; that is, how carbon-dioxide can serve it as food.

The changes that go on must take place very near the surface of the plant. They occur indeed in the green parts and the first of them take place in these only. If we examine a mushroom or any plant that is not green we find that such plants do not absorb carbon-dioxide. The green colour then is concerned in the feeding process. Now if we take a green leaf and examine a thin slice of it with the microscope we find that under the outer skin or epidermis there are numbers of cells which contain the green colouring matter. We want rather a high power of the microscope, but with one magnifying about 200 times we see that the green colour is not spread through the whole substance of these cells, but that they contain a number of small green bodies, each with a sharp outline and a well defined shape. These little green bodies are known as *chlorophyll grains* and every leaf contains a vast number of them. The plant which is not green has not any of these little bodies in it.

When we look at these little bodies with a still higher power of the microscope we find that some-

times we can make out that embedded in them are still smaller bodies, which turn blue when a little solution of iodine is made to come in contact with them. These little bodies are small grains of starch. Whether the chlorophyll grains contain these little masses of starch or not will depend on whether the leaf has been exposed to sunlight. If it has, they are formed in the chlorophyll grain—if it has not, they are absent from it. We can compare the leaf cells prepared in the afternoon of a bright day with the same prepared in the early morning, when the leaf has been through the darkness of the night.

It is then the chlorophyll bodies which do the work of transforming the carbon-dioxide into part of the plant substance, and the starch is the first visible result of their activity. Think now of the conditions that are found in such a cell of a leaf. We have the chlorophyll grains, which are embedded in the protoplasm of the cell—we have the cell sap, largely composed of water, occupying the cavity of the cell. When carbon-dioxide is taken into such a cell in the way which we studied last month it is decomposed, or *split up*, by the chlorophyll bodies. At the same time, some of the water is also split up, and the result of this splitting is that oxygen is liberated from both the carbon-dioxide and the water. The oxygen so set free is given off from the cell and escapes into the air, while the hydrogen from the water and the remains of the carbon-dioxide are made to combine together. Only part of the oxygen from the carbon-dioxide is taken away from it, leaving behind a compound of carbon and oxygen known as carbon-monoxide. This contains just half the oxygen of the carbon-dioxide. So then carbon-monoxide and hydrogen are made to unite together, forming a body containing carbon, oxygen and hydrogen. The oxygen that is given off so is found to come partly from water and partly from carbon-dioxide. This process is the beginning of the construction or building up of starch. The further stages of the formation of starch have not yet been fully ascertained, but there is no doubt that the body we have spoken of as being the result of the union of the carbon-monoxide and the hydrogen is transformed into starch in the chlorophyll grain.

Now this constructive process involves of course a certain amount of work, which the chlorophyll grain can carry out. All work, wherever done, must be done by the expenditure of a certain amount of energy. If we lift a weight we expend some of the substance of our muscles in lifting it, that is, some energy or force is applied to do the work. If we notice a steam engine at work we see that all the work done is done at the expense of some fuel supplied to the engine—in this case the fuel supplies the energy required. So with the plant—it cannot do this work unless some energy is supplied to it to do it with. This explains why this process only goes on in sunlight—the energy of the sun's rays is that with which the work is done. If no light be admitted, we have seen that no oxygen is given off and that no starch is formed. We have, here, then the story of the feeding of the plant, as far as the action of the chlorophyll in splitting up carbon-dioxide is concerned.

But the roots also have a great deal to do with the process of supplying the plant with food. We have seen that they are always absorbing water from the soil, and that in this water certain substances that exist in the soil are dissolved. What are these substances? If we remember that the feeding of the plant must include the supply of everything the plant wants for forming its protoplasm or living substance, we see that something more than carbon, hydrogen, and oxygen is necessary. The living substance contains nitrogen, and this nitrogen can only be obtained from the roots.

Among the substances taken up from the soil, therefore, we find certain compounds containing nitrogen. The most advantageous forms of these are those which consist of nitric acid, in combination with soda, or potash, or ammonia. Nearly as useful are the compounds of ammonia with various acids. These are wanted, then, by plants just as much as carbon-dioxide and water, and the supply of them in agriculture forms part of the very large question of manures. Manures are really the materials which are supplied by the farmer to the soil to supply what the plants require as food.

We have seen that various soils contain very different amounts of these so-called inorganic salts. Some have naturally in them all, or nearly all, that the plant needs. Others, on the other hand, contain only some of them, some, indeed, very little of them. Thus the problem of manuring is a very complicated one, involving first a knowledge of what a particular plant requires, and then the discovery of whether or no those particular substances are present in the soil in which it is to be cultivated. We shall, however, shortly discuss this question more fully.

Besides these compounds of nitrogen, we find by experiment that plants want for their food certain other chemical elements. All require sulphur and phosphorus in small amount. These two are also found to be present in the living substance. They, like the nitrogen compounds, must be supplied to the plant in compounds taken up by the roots.

Besides these elements, which really form the plant's substance, there are others which are necessary to enable it to work up those we have already spoken of. What they do to help it, we do not know at present at all well; unless, however, they are there, the plant cannot properly use the others. Such are potassium, calcium, and magnesium—in some cases also chlorine.

Iron, too, we have seen to be needed for the work of chlorophyll. Indeed, unless iron is present, chlorophyll cannot even be formed.

We found that we could not explain fully the steps by which starch was formed in the leaves. Nor are we able to say how these various bodies, which are absorbed in the water taken up by the roots, are worked up into the living substance. The manufacture seems, like the manufacture of starch, to take place in the leaves, to which we have seen the water passes after it is absorbed.

We must not forget here the necessity for the plant to be exposed to a proper temperature, which we pointed out last month, when we said that at too low a temperature the absorption of carbon-dioxide was stopped. If we examine the young shoots that come up in the early spring we can often see the effect of cold. The shoots in very cold weather are found to be yellow and not green, and the microscope then shows us that the chlorophyll grains have not developed their green colour properly.

The feeding of a plant with these various gases and salts thus leads to the formation in its cells of various

so-called organic bodies, some containing nitrogen, others, as starch, containing none. It is evident, however, that as these are formed in the leaves, while the growth of the plant involves the formation of new leaves, stems or branches, flowers, and roots, something else is necessary than the mere formation of these bodies. They must be transported from the places where they are formed to the places where these new parts of the plant are appearing. We must next try to study the provision made in Nature for this removal; in other words we must examine the question: How do plants grow? In connection with this we shall try further to find what is the meaning of the absorption of oxygen, which so far has not been seen by us to have any bearing on the feeding of the plant.

To recapitulate, we have seen—

1. That the power of making use of the carbon-dioxide absorbed by the leaves is connected with the presence in their cells of peculiar green structures, known as chlorophyll grains.

2. That in the absence of these grains plants cannot feed on carbon-dioxide.

3. That these grains can, under proper conditions, form small starch grains inside themselves.

4. That the starch so formed results from the splitting up of carbon-dioxide and water, the oxygen so set free being exhaled, and the remaining gases made to enter into a fresh combination.

5. That this can only take place when the plant is exposed to light, and when a small quantity of iron is supplied to it.

6. That a proper temperature is necessary for the process.

7. That the roots take part in the feeding of the plant by the substances which they absorb being caused to pass upwards to the leaves.

8. That compounds of nitrogen are the most important of these substances, and that compounds of other elements are also necessary to the well-being of the plant.

(To be continued.)

—o—

MODEL ANSWERS TO THE MATRICULATION QUESTIONS.

LONDON: JUNE, 1891.

GEOMETRY.

Wednesday, 10 to 1.

Examiners—PROFESSOR HORACE LAMB, M.A., F.R.S., JOSEPH LARMOR, ESQ., D.Sc., M.A.

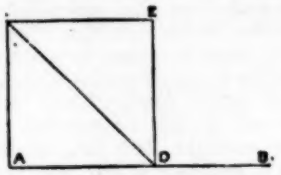
(All the usual abbreviations may be used in answering the questions on this paper.)

1. Erect a perpendicular to a given straight line AB, at the point A.

How would you construct the perpendicular when the given straight line terminates at A, and it is not allowed to produce it?

(*a*) Produce BA to C, making AC equal to AB. On CB describe an equil. Δ

(*Proceed as in Euc.* I. 11.)



(*b*) Avoiding the use of all propositions dependent on Euc. i. 11., we construct as follows:—

In AB take any point D.
From D draw DE $\perp^{ar}$ to AB, and make DE equal to DA.
From E, towards A, draw EF $\perp^{ar}$ to DE.
Bisect ∧ ADE by DF, meeting EF in F.
Join AF.

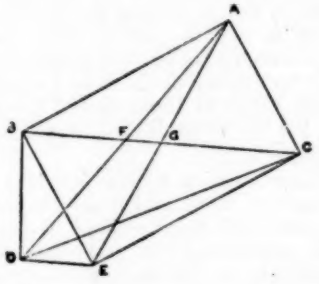
Then in Δ^s ADF, EDF, we have—
AD = DE.
DF common.
∧ ADF = ∧ EDF.
∴ ∧ DAF = ∧ DEF.

But DEF is a rt. ∧.
∴ DAF is a rt. ∧.
And AF is $\perp^{ar}$ to AB.

2. If two triangles of equal area are in the same plane and on the same base, the line joining their vertices is either parallel to the base or is bisected by the base.

Case I, in which the triangles are on the same side of the base; the line joining their vertices is parallel to the base. (*See Euc.* I. 39.)

Case II, in which the triangles are on opposite sides of the base; the line joining their vertices is bisected by the base. This theorem is best proved by the use of two well-known theorems.—(1) The diagonals of a par$^{gm.}$ bisect each other. (2) If through the middle point of one side of a Δ a line is drawn parallel to the base, it will bisect the other side.



Let Δ^s ABC, DBC be of equal area and on opposite sides of BC.
Through B draw BE ∥ to AC.
Through C draw CE ∥ to AB, meeting BE in E.
Join ED.
Join AD, meeting BC in F.
Join AE, meeting BC in G.

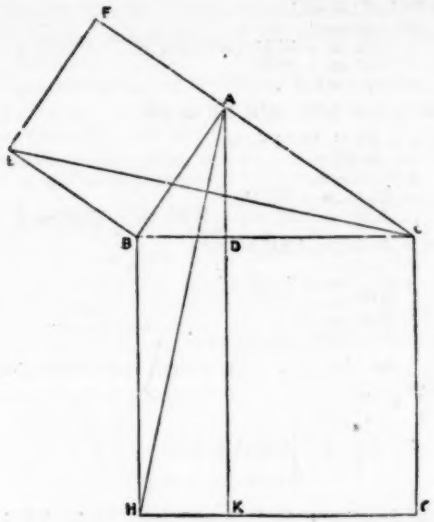
Then ABEC is a par$^{gm.}$
∴ Δ BCE = Δ BAC = Δ DBC.
∴ DE is ∥ to BC.

Also, since BC, AE are diags. of par$^{gm.}$, G is middle point of AE.
And GF is ∥ to DE.
∴ F is middle point of AD.

3. Give a definition of a square free from redundant conditions.

If the angle A of a triangle ABC be a right angle, and AD be drawn perpendicular to BC, prove that the square on AB is equal to the rectangle BC, BD.

(*a*) A square is a four-sided figure which has all its sides equal and one of its angles a right angle.



(*b*) On AB describe sq. ABEF.
On BC describe sq. BCGH.
Produce AD to meet HG in K.
Join AH, EC.

Then because $\wedge^s$ BAC, BAF are each rt.
$\therefore$ CA and AF are in one st. line.
$\therefore$ par^{gm}. BF = twice Δ EBC.

And because AK is $\parallel$ to BH.
$\therefore$ par^{gm}. BK = twice Δ HBA.

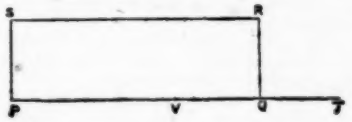
And in Δ^s EBC, HBA we have—
EB = BA being sides of a sq.
BC = BH being sides of a sq.
$\wedge$ EBC = $\wedge$ ABH, for each = $\wedge$ ABC + a rt. $\wedge$
$\therefore \Delta$ EBC = Δ HBA.
$\therefore$ par^{gm}. BF = par^{gm}. BK.

But par^{gm}. BF is sq. on AB;

And par^{gm}. BK = rect. BC, BD,
since BH = BC, and $\wedge$ at B is r.
$\therefore$ sq. on AB = rect. BC, BD.

4. If a straight line be divided into any two parts, the squares on the whole line and on one of the parts are equal to twice the rectangle contained by the whole and that part, together with the square on the other part. (*See Euc.* II. 7.)

5. Of all rectangles of given perimeter, that which has the greatest area is a square.



Let PQRS be a rect. of given perimeter.
Produce PQ to T, making QT = QR.
Bisect PT in V.

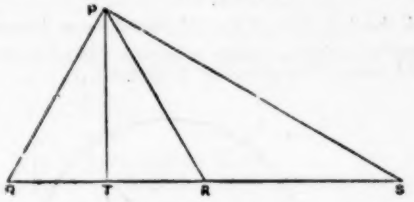
Then because—
PQ + QR = half of given perimeter.
$\therefore$ PT = half of perimeter.
$\therefore$ sq. on VT will be of given perimeter.

But sq. on VT = rect. PQ, QT + sq. on VQ.
$\therefore$ sq. on VT is greater than rect. PQ, QT, that is than rect. PQ, QR.
$\therefore$ a sq. of given perimeter has a greater area than any rect. of same perimeter.

6. If the angle A of a triangle ABC be obtuse, the square on BC exceeds the sum of the squares on BA, AC, by twice a certain rectangle. State what rectangle this is, and prove the theorem.

The side QR of an equilateral triangle PQR is produced to S, so that RS = QR; prove that the square on PS is three times the square on PR.

(*a*) The rect. is either that contained by BA and the st. line intercepted between A and the perpendicular from C on BA produced, or that contained by CA and the st. line intercepted between A and the $\perp^{ar}$ from B on CA produced. (*For proof see Euc.* II. 12.)



(*b*) From P draw PT $\perp^{ar}$ to QR.
Then in Δ^s PQT, PRT we have—
PQ = PR.
$\wedge$ PTQ = $\wedge$ PTR.
$\wedge$ PQT = $\wedge$ PRT.
$\therefore$ QT = TR.

Because $\wedge$ PRT is acute.
$\therefore \wedge$ PRS is obtuse.
$\therefore$ sq. on PS = sq. on PR + sq. on RS + twice rect. SR, RT.

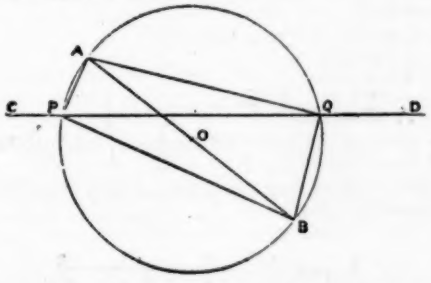
But QR = twice RT.
$\therefore$ twice rect. SR, RT = rect. SR, RQ = sq. on SR.
$\therefore$ sq. on PS = sq. on PR + sq. on RS + sq. on RS.
= three times sq. on PR.

7. An angle at the centre of a circle is double an angle at the circumference standing on the same arc.

A, B are any two points on opposite sides of a straight line CD; find at what points of CD they subtend a right angle.

(*a*) (*See Euc.* III. 20.)

(*b*) Join AB, and bisect AB in O.



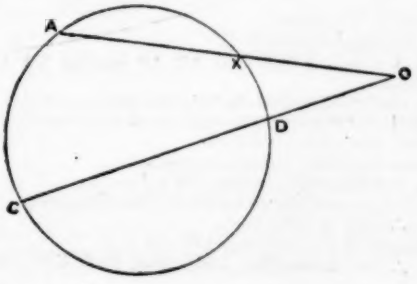
With centre O, at the distance OA or OB, describe the circle AQBP, meeting CD in P and Q.
Join AP, BP, AQ, BQ.
Then, because AB is a diam. of the circle, the $\wedge^s$ APB, AQB are rt.

$\therefore$ A and B subtend rt. $\wedge^s$ at P and Q, and at no other points in CD; for, if any other point, X, be taken in CD, then,

If it is outside the circle,
$\wedge$ A X B is less than rt. $\wedge$ APB or AQB;

If it is inside the circle,
$\wedge$ A X B is greater than rt. $\wedge$ APB or AQB.

8. AB, CD are two straight lines which, being produced, intersect in O; prove that if the rectangles OA, OB and OC, OD are equal, the four points A, B, C, D lie on a circle.

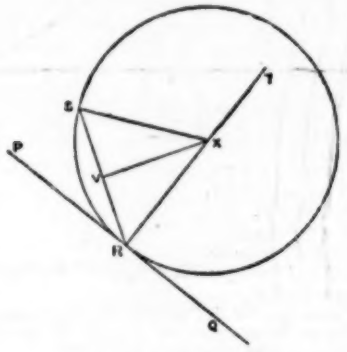


Describe a circle about the Δ ACD, meeting AO in X

Then rect. OA, OX = sq. on tangent from O,
= rect. OC, OD. (*See Euc.* III, 36.)
= rect. OA, OB.
∴ OX = OB.

That is the circle through A, C, D must also pass through B.

9. Describe a circle touching a given straight line at a given point, and passing through another given point.



Let PQ be the given st. line, R the point in it, and S the other point.

If S be in PQ the problem cannot be done. If S be not in PQ—

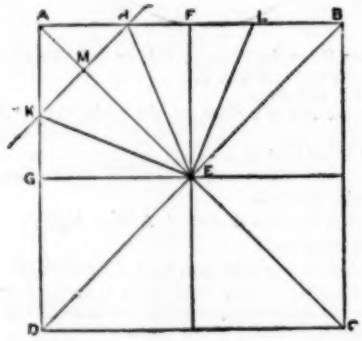
From R, on the same side of PQ as S, draw RT ⊥ar to PQ.

Join RS, bisect RS in V, and draw, on the same side of SR as T XV ⊥ar to RS; VX will meet RT since ∧ VRX is acute; let them meet in X.

Then in Δs SVX, RVX, we have
SV = RV,
VX common,
∧ SVX = ∧ RVX,
∴ SX = RX.

With centre X and radius XS describe a circle; this will pass through R, and touch PQ at R, since RX is ⊥ar to PQ.

10. Given a square, show how to obtain from it a regular octagon, by cutting off the corners.



Let ABCD be a square.

Draw the diags, meeting in E.

Through E draw st. lines ‖ to AD, AB, meeting AB, AD in F, G respectively.

Bisect the ∧s FEA, GEA, by EH, EK, meeting AB, AD in H, K.

Join KH, and in a similar manner cut off the corners at D, C, B.

We shall thus obtain an octagon.

To prove that it is a regular octagon—

Bisect ∧ FEB by EL, meeting FB in L.

FE, FB may readily be proved to be sides of a square.
∴ FEB is half a rt. ∧.

Similarly FEA, GEA are each half a rt. ∧.
∴ their halves FEL, FEH, HEA, AEK, KEG are equal.

In Δs FEL, FEH we have
FE common,
∧ EFL = ∧ EFH, both being rt.
∧ FEL = ∧ FEH.
∴ FL = FH.

Similarly, in Δs AKE, AHE, KE = HE.

Then in Δs KEM, HEM we have
KE = HE.
EM common.
∧ KEM = ∧ HEM.
∴ KM = MH, and ∧ KME = ∧ HME = rt. ∧

Again, in Δs MEH, FEH we have
HE common.
∧ MEH = ∧ FEH.
∧ HME = ∧ HFE.
∴ MH = HF.
∴ their doubles KH, HL are equal.

Similarly the other sides of the octagon may be proved equal to one another.

CHEMISTRY.

Wednesday, 2 to 5.

Examiners.—PROF. H. E. ARMSTRONG, PH. D., F.R.S.; PROF. W. A. TILDEN, D. Sc., F.R.S.

1. State any facts known commonly which suggest that the air is concerned in the changes which attend the combustion of coal in an ordinary fire. Describe any experiments you have witnessed which afford proof that such is the case.

The following facts suggest at least that the combustion of an ordinary fire is (*a*) diminished by diminishing the supply of air, (*b*) increased by increasing the supply of air.

(1) When a fire is 'smothered' by a layer of small coal thrown on top of it, air cannot pass through, and the fire gradually goes out.

(2) When the layer is broken up the fire revives.

(3) When the bottom of the grate is choked by the collection of ashes, the passage of air is impeded, and the fire gradually goes out.

(4) When the bottom of the grate is cleared the fire revives.

(5) Fires burn badly in ill-ventilated rooms, or when the chimney is closed.

(6) Opening a door or a window will revive a fire.

(7) Bellows, by forcing into the fire a special supply of air, make it burn brightly.

(8) A 'blower,' by creating a strong upward draught through the bottom of the fire, makes it burn rapidly.

Experiments: Take two jars, and in each suspend a piece of burning coal, or (to simplify the experiment) a well-lighted piece of wood. When these have ceased to burn, remove them, and cover the jars.

Into the first jar thrust a lighted taper; it will be extinguished at once. This proves that the free oxygen in the jar has been used up by the burning coal.

Into the second jar pour clear lime-water, and shake it up; it will immediately be rendered milky. This proves the presence of carbonic acid gas, a product of the combustion of coal.

Take a third jar, and before inserting the burning wood divide the neck by a thin partition. Then cause a current of air to pass down one side of the neck. The wood will burn for a longer time than in the other jars.

2. Describe the apparatus you would use, and the precise manner in which you would set to work, to prepare from common salt such a solution as is sold under the names *spirit of salt, muriatic acid*, or *hydrochloric acid*.

Common salt in its ordinary form offers a large surface, and when sulphuric acid is added the mixture froths over. Begin therefore by melting a sufficient quantity of common salt in a clay crucible at red heat; pour it when melted upon a cold iron plate, and break it up when cool into small lumps. Preserve these from moist air in a dry bottle.

Put 10 parts by weight of this salt, with 20 parts by weight of water into a large generating flask (A), fixed in the retort-stand, in a sand bath, over a Bunsen burner.

The flask (A) must be provided with a cork containing two tubes (a_1 a_2)—

a_1, a thistle tube, reaching to within about half an inch of the bottom,

a_2, a short delivery tube, leading off into a wash-bottle B.

B must contain a little water and be provided with three tubes (b_1 b_2 b_3)—

b_1, Connected with a_2, and leading well under the water,

b_2, A safety tube, to prevent 'running back,' dipping just below the surface of the water,

a_2, A delivery tube, joined to a tube, c_1, arranged for downward displacement in the jar C.

C is a large jar, standing in water, and partly filled with water, the tube c_1 leading into the water.

All the tubes must be thoroughly dried.

Now pour gradually down the thistle tube a_1 about 20 parts by weight of concentrated sulphuric acid. At once the gas will be freely evolved, even without heat. After a time it may be necessary to heat the mixture slightly. When enough gas has been obtained, sever the connection between A and B.

The water in the wash-bottle will absorb any sulphuric acid and salt mechanically carried over, and, until saturated, will dissolve the gas; then the hydrochloric acid will pass pure into the water of C. This will be an aqueous solution of HCL,—what is generally sold as Hydrochloric Acid.

3. How may it be shown that the gases named Carbon Monoxide and Carbon Dioxide contain different proportions per cent. by weight of carbon?

Introduce into the bent eudiometer 100 volumes of carbon monoxide and 75 volumes of oxygen, and explode them by electric spark. 125 volumes will be found remaining, of which 100 will be absorbed by caustic potash. Hence, 100 volumes of carbon dioxide have been formed out of 100 volumes of carbon monoxide and 50 volumes of oxygen.

Now, by burning a weighed amount of carbon in oxygen, and weighing the resulting carbon dioxide, it can be ascertained that 12 parts by weight of carbon are combined with 32 parts by weight of oxygen in 44 parts by weight of CO_2; or, in CO_2 the weight per cent. of C is 27·28; therefore, applying the above results, in CO the weight per cent. of C is $\frac{12}{28} \times 100 = 42{\cdot}86$.

4. Describe the characteristic properties of common and of red Phosphorus, and state the conditions under which the white is turned into the red, and the red into the white variety.

Common phosphorus is a solid, soft enough to be cut with a knife, semi-transparent, almost colourless (slightly yellow). At ordinary temperatures it is of a wax-like consistency, and when cut presents a surface of a waxy lustre. At low temperatures it is brittle and crystalline. Its specific gravity is 1·83. It melts at 44°, into a transparent liquid; and boils at 290°, giving rise to a colourless gas. In air it gives off white fumes, having a strong smell of garlic. In the dark it has a pale luminous appearance. It will take fire a little above fusing point, and friction, or a blow, or the heat of the hand are sufficient to ignite it in air. It is insoluble in water, slightly soluble in alcohol and ether, but readily dissolves in turpentine and some other oils. It is freely soluble in carbon disulphide. It is a violent poison.	Red phosphorus is a solid, opaque, varying from dark red to vermilion in colour, amorphous. Its specific gravity is 2·11. In sealed tubes it can be heated to 500°, and sublimed without fusion. It does not fume in air, is odourless, and is not luminous in the dark. It does not take fire in the air until heated to above 260°. It is insoluble in carbon disulphide, and not poisonous.

If ordinary phosphorus is heated in an atmosphere incapable of acting chemically upon it (such as carbonic acid or hydrogen) to a temperature of 240°, and so kept for some hours, it is converted into red phosphorus. The change goes on more rapidly if it is heated in sealed tubes to 300°. Or if iodine is heated with an excess of ordinary phosphorus, the portion which does not combine with the iodine is turned into the red variety. The same change is also slowly produced by the action of light.

If red phosphorus is heated to above 260° it becomes wholly converted into the white variety.

5. What volume of Sulphur Dioxide is formed by burning 10,000 litres of Hydrogen Sulphide, and how many kilograms of Sulphuric Acid, H_2SO_4, are theoretically producible therefrom? S = 32, O = 16.

(*a*) The equation is—

$$2SH_2 + 3O_2 = 2SO_2 + 2H_2O$$

Hence the volume of oxide formed is equal to that of the hydrogen sulphide burned.

= 10,000 litres.

(*b*) The equation is—

$$2SO_2 + O_2 + 2H_2O = 2H_2SO_4$$

Hence 2 (32 + 32) parts by weight of SO_2 produce 2 (2 + 32 + 64) parts by weight of H_2SO_4. But 10,000 litres of SO_2 weigh $10{,}000 \times \frac{64}{22.4} \times {\cdot}0896$ grammes, and from these $\frac{196}{128}$ × 32 × 896 grammes of H_2SO_4 are producible.

= 49 × ·896 kilograms = 43·904 kilograms.

6. Complete the following equations—

(*a*) $HNO_3 + NH_3 =$
(*b*) $2HCL + Na_2CO_3 =$
(*c*) $2NaBr + CL_2 =$
(*d*) $NaNO_3 + NaHSO_4 =$
(*e*) $Na_2SO_3 + H_2SO_4 =$

(*a*) $(NH_4)\,NO_3$
(*b*) $2NaCE + CO_2 + H_2O$
(*c*) $2NaCE + Br_2$
(*d*) $Na_2SO_4 + HNO_3$
(*e*) $Na_2SO_4 + SO_2 + H_2O$.

HEAT AND LIGHT.

Wednesday, 2-5.

Examiners—Prof. G. F. Fitzgerald, M.A., F.R.S., Prof. Oliver J. Lodge, D.Sc., LL.D., F.R.S.

Answer Neatly.

1. Define 'coefficient of expansion.' If the linear coefficient of expansion of iron is ·0000123, find the increased capacity (in litres) of a cylindrical steam engine boiler, which at the freezing-point in 7 metres in length, and 3 in diameter, when heated from 15° to 150°.

The coefficient of expansion of any substance for a given range of temperature is the ratio of the average increase of length or volume in the substance for that range of temperature to the length or volume of the same mass at 0° C.

Linear coeff. of expansion - - - - - - -	·0000123
Approximate cubical coeff. - - - - - - -	·0000369
Coeff. of expansion for 15°, from 0° to 15° - - -	·0005535
Coeff. of expansion for 150°, from 0° to 150° - - -	·005535

Capacity of boiler at 0° = $7 \times \pi \times (\frac{3}{2})^2$ cubic metres

= $\frac{63}{4}$ cubic metres

∴ Cap. of boiler at 15° = $\frac{63}{4}$ × ·0005535 c. metres

and cap. of boiler at 150° = $\frac{63}{4}$ × ·005535 c. metres

∴ Increase in capacity = $\frac{63}{4}$ (·005535 − ·0005535) c.m.

= 99 × ·00249075 c.m.

= ·24658425 c.m.

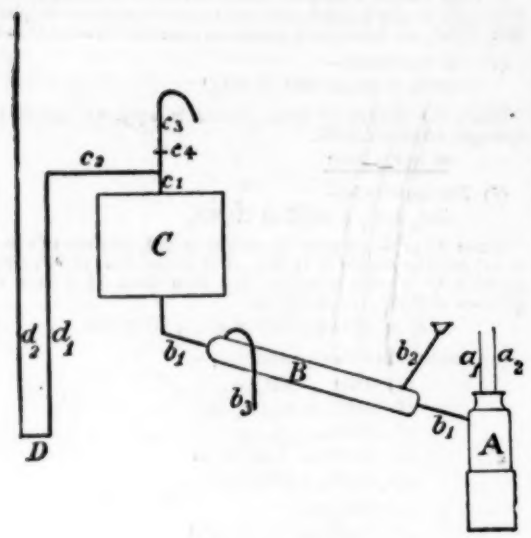
= 246·58425 litres.

2. Define the terms 'boiling-point of a liquid,' and 'saturated vapour.' State how the pressure of saturated steam at various temperatures has been measured.

The temperature at which, under the normal atmospheric pressure, the ebullition of a liquid commences is known as the boiling-point of that liquid.

When a vapour, at a given temperature, exerts its maximum pressure for that temperature, and is also at its maximum density for that temperature, it is said to be *saturated*.

Regnault's method of measuring the pressure of water vapour at various temperatures depends upon the fact that *the pressure of the steam of boiling water is equal of the external pressure.*



The chief parts of the apparatus are a boiler A, in which water can be raised to different temperatures; a reservoir C, in which the air can be rarefied or compressed at will; a manometer D, to indicate the pressure in C.

a_1 a_2 are thermometers to give the temperature of the vapour in A.

The connection between A and C is a tube b_1 sloping upwards, kept cool in a condenser B, by a stream of water passing in at b_2 and out at b_3.

The reservoir C is connected with the manometer by tubes c_1 c_2. At c_1 is a stopcock, and c_2 is connected with apparatus for rarefying and condensing the air in C.

The air in C was first rarefied until the water in A boiled at 50° C, and the pressure was noted in D. Then by varying the pressure in C the water was made to boil at different temperatures, up to 100° C. After this, it was necessary to compress the air in C. At each temperature the manometer indicated the maximum pressure of water vapour at that temperature.

3. If dry ice, at its melting point, be thrown into 20 lbs. of water at 60° C. until the whole weighs 23 lbs., what fall of temperature will have been thereby produced? How much mechanical work must be done on the water in order to restore its original temperature?

The latent heat of water is 80.

The heat required to melt 3 lbs. of dry ice as 0° C. is therefore 3×80 pound-degrees.

The 20 lbs. contained 20×60 pound-degrees.

The 23 lbs. therefore contain $20 \times 60 - 3 \times 80$ pound-degrees, and the temperature is reduced to

$$\frac{20 \times 60 - 3 \times 80}{23} = \frac{960}{23}$$

Hence the fall in temperature is

$$60 - \frac{960}{23} = \frac{420}{23} = 18° \cdot 26.$$

Joule's equivalent* of the pound-degree Centigrade is 1390 foot-pounds; hence, to raise 23 lbs. of water through 18° ·26 (to 60°) the mechanical work necessary will be

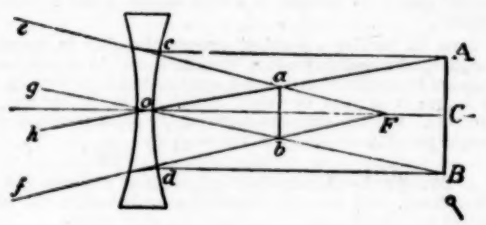
$$23 \times \frac{420}{23} \times 1390 = \underline{583800 \text{ foot-pounds.}}$$

4. Describe how the velocity of light can be obtained by observations made on the positions of fixed stars, with respect to the zenith, at different seasons of the year.†

The general principle may be thus illustrated:—To a passenger in a railway train, rain vertically falling appears to *slant*, and the track of the rain-drops on the windows will also slant, and its direction will depend upon the ratio of the velocity of the train to the velocity of the falling rain. Suppose, now, that the train *returns* at the same rate through the same rain. The track of the rain-drops will slant in the opposite direction, and by measuring the angle between the two slanting tracks the passenger might calculate the ratio between the velocity of the train and that of the rain, and, if the former were known, ascertain the latter.

Now, the velocity with which the earth is moving round the sun at any given time is known, and its velocity six months later is known to be the same, but in the opposite direction (as regards the stars), since it is at the opposite extremity of a diameter of its orbit. Meanwhile rays of light from fixed stars are reaching the earth. The observer does not know the true direction of the rays from any fixed star, but he notices that their *slant* is continually changing, and by measuring the change in six months he can deduce the ratio of the velocity of the earth to the velocity of light. This is found to be about $\frac{1}{10000}$, which gives (reckoning the earth's velocity at 18½ miles per second) about 185,000 *miles per second* as the velocity of light. The above observations are all taken in the observer's meridian, and consist, essentially, of daily measurement of the star's distance from the observer's zenith.

5. Explain, with the help of a diagram, what sort of an image is formed by a concave lens. A concave lens of 10 centims. focal length, is placed 50 centims. from an object 2 centims. high. Calculate the size of the image, and draw a diagram of the rays by which it is seen. Is it real or virtual? Is it erect or inverted?



Let AB be an object, O the centre of the concave lens, and OF the principal axis.

To find the position of the image of A, it is sufficient to find the point where any two rays from A, after refraction, intersect. Similarly for the image of B; and the positions of the images of A and B being determined, the whole image of AB will lie between these positions.

Take two rays from A, one Ac parallel to the axis, the other AO passing through the centre. The ray Ac will be refracted along *ce*, emerging as if it came from the principal focus F. The ray AO will suffer no deviation, and these two rays will appear to intersect at *a*. Similarly, by drawing B*d* parallel to the axis, and F*d* from the focus, we obtain *C* the position of the image of B.

The image of AB therefore, seen by an eye placed on the opposite side of a concave lens, is (1) erect, (2) virtual, (3) diminished, (4) between the lens and the object.

In the example given we have—

OF = 10 centimetres
OC = 50 centimetres
AB = 2 centimetres.

First, to find the distance of the image from the lens. Let v be the distance. Then by formula,

$$\frac{1}{v} - \frac{1}{50} = \frac{1}{10}$$

$$\therefore v = \frac{50}{6}$$

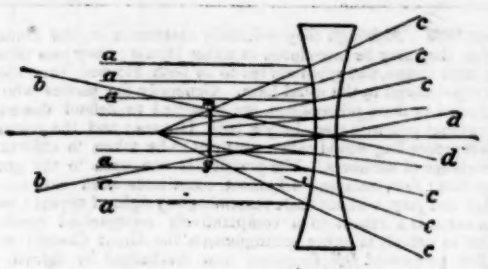
But size of image : size of object
:: distance of image : distance of object.

$$\therefore \text{Size of image} = \frac{50}{6} \times \frac{1}{50} \times \frac{2}{1}$$

$$= \underline{\frac{1}{3} \text{ of a centimetre.}}$$

* 'Model Answers' should contain no criticisms of the questions, but it may be remarked here that the University Regulations say nothing whatever about 'the mechanical equivalent of heat.'

† Any detailed answer to this question would be quite above the Matriculation standard.



The figure shows rays *a a a* ·· coming from the object on the *left* parallel to the axis and refracted in the directions *c c c*. Two rays only (*b b*) are represented as coming from the extremities of the object and passing undeviated through the optical centre of the lens (*d d*). The rays *c c c* ·· *d d* seen by an eye on the *right* of the lens give the impression of an image *m g* on the *left* of the lens.

The image is *virtual*, and *erect*.

6. When white light passes through a red liquid and goes out red, has it acquired its colour from the liquid? If not, explain what has happened, and show how to prove your assertions experimentally.

No. When white light passes through a liquid the liquid transmits only those rays which have a certain rate of vibration, and absorbs the rest. The resultant light is still composite, but no longer has all the components which go to make up white light, and if the colour be red we call the liquid red.

If the rays on emerging from the red liquid be passed through a spectroscope, the rays of varying rates of vibration are separated, and we may observe (by comparison with the spectrum of the original white light) which rays are missing. The number of these will depend not only upon the nature of the liquid, but upon the depth of it through which the white light passed; but there will always be in the spectrum one or more *relatively* dark 'absorption bands.' *

—o—

THE 1892 SCHOLARSHIP EXAMINATION.

BY DR. GEORGE BEACH, M.A.

Co-Author of 'A Manual of our Mother Tongue,' 'A Girl's Arithmetic,' Author of 'Elements of English,' 'Entertaining Readers,' etc.

1. From many communications we have discovered that a considerable number of Scholarship Candidates have suffered, some grievously, through confusing the Scholarship Regulations concerning the extra marks for Drawing, and the Science and Art Department's Regulations respecting the Drawing Certificate 'D.' Because Second Class Passes are of no use towards securing the 'D,' it has been often rashly concluded that these secure no marks in the Scholarship Examination. Such an opinion is utterly without foundation. The Scholarship Regulation reads, '*Pupil Teachers who during their engagement successfully work papers in Freehand, Geometry, Perspective and Model Drawing, are credited with marks in any future examination under Articles 46 or 56.*' Article 46 refers to the Scholarship, and Article 56 to the Certificate Examination.

Two typical cases may be mentioned:—One candidate in the First Class just missed getting into a Metropolitan Training College through omitting under this misapprehension to put down a pass in Model Drawing. Another candidate had *four* Second Classes, and did not enter any of them on the official form. She was placed midway down the Second Class List. Neither of these candidates, we are sorry to say, has secured admission to any College, whereas had they been correctly informed, both would have been in residence next February.

* The Regulations make no mention of the subject of Absorption, and we consider this question iniquitous.

2. Another misapprehension is that:—'If a Scholarship be not taken up in the ensuing year, it is forfeited.' There is no such regulation. There are yet a few First Classes left out in the cold. To these we would say, 'Although you cannot enter into training this year, try and negotiate with the authorities of some Training College to admit you in 1893.' This will relieve them of much anxiety, and they may take time by the forelock (or firelock), and study the subjects of the First Year, twelve months in advance.

3. Yet another misapprehension is that:—'If a candidate pass too low down to utilise the Scholarship, only one more trial is left.' Again we say, 'Nothing of the kind.' The regulation misunderstood reads as follows:—'*Candidates who fail twice to pass the Queen's Scholarship Examination may not be again examined.*' *Art. 49 (d).*

4. In close connection with the above is the following information:—'All candidates who sat at the last Queen's Scholarship examination, even if they have previously failed twice, will be permitted to sit again in 1892; but after that year no Pupil Teacher will be allowed to take the final examination more than twice.'

5. Answering many queries, and probably preventing many others, it is well to state what pathways are open to the unlucky scholarship candidate who has failed for the first time. In the *first* and best place, he may extend his apprenticeship for another year in the same school; *second*, he may be transferred as a Pupil Teacher to another school; *third*, he may, until the next Queen's Scholarship Examination, become an assistant in any school; or *fourth*, there is no responsibility devolving upon him to 'sit' again—*i.e.*, he may leave the profession.

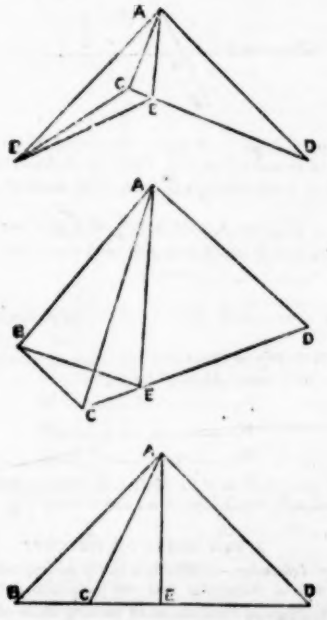
6. Candidates at Church of England Training Colleges are inquiring about the Religious Examination syllabus. It is:—

(*a*) The narrative portions of Old Testament from Genesis to the Death of Saul.
(*b*) The Gospel according to St. Matthew.
(*c*) The Catechism with Scripture proofs.
(*d*) The Order for Morning and Evening Prayer.

ALTERNATIVE METHODS OF EUCLID.—(*Continued.*)

PROP. 24.

In this prop. much unnecessary difficulty is introduced by Euclid's method, which requires the insertion of the words 'of the two sides DE and DF, let DE be the one which is not the greater.'



Let ABC and ADC be two Δs, which have their two sides BA and AC respectively equal to the two sides DA and AC, but the ∧ DAC > ∧ BAC. Then base DC shall be greater than base BC.

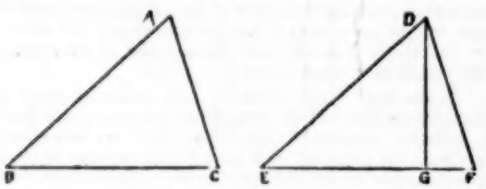
For if the triangles be applied so that one = side AC in each coincides, and the other = sides fall on opposites sides of AC, then if the ∧ BAD be bisected by AE cutting DC in E, then the point E shall fall above line BD, below line BD, or in the same straight line as BD. If necessary join BE.

Proof. ED = BE (I. 4); but CE and BE > BC (I. 20); ∴ CE and ED > BC; ∴ CD > BC.

Q. E. D.

PROP. 26. In this proposition two different diagrams are not necessary.

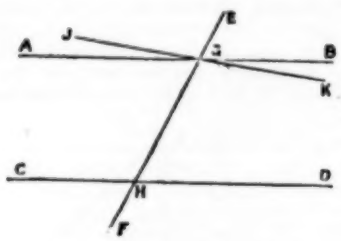
Case I. Let ∧s ABC and BAC be respectively = to ∧s DEF and EDF and side AB = side DE.



Case II. Let ∧s BAC and ACB be respectively = to ∧s EDF and DFE and side AB = side DE.

PROP. 29 AND AXIOM XII.

A great deal of well-founded objection is raised against Axiom XII. on the ground that *it is not self-evident.* In its place it has been proposed to introduce a subsidiary proposition or secondary axiom founded on *Def.* 8 *of an line* and *Def.* 20 *of parallel lines.* This is as follows:—*If two lines intersect they cannot both be parallel to a third straight line.* This appears obvious, for if two lines intersect they cannot both be continually produced in the same direction, and one of them at least must continually approach the third straight line until it meet it.



Let AB and CD be || straight lines and EGHF another line cutting AB in G and CD in H. Then the ∧ AGH shall = ∧ GHD.

Proof. For if not through G draw JGK making ∧ JGH = to ∧GHD.

Then ∵ ∧ JGH = ∧ GHD, line JGK is || to CHD.

∴ both JK and B which intersect at G are || to CD. Which is absurd, etc.

Q. E. D.

PROP. 30. One case of this is refreshingly simple and deserves notice.

Let LM, NO, PQ be three straight lines of which both LM and PQ are || to NO, then LM shall be || to PQ.

L———————M

N———————O

P———————Q

Proof. For since LM is || to NO, LM cannot meet NO if continually produced, much less, then, can it meet PQ. ∴ LM is || to PQ.

A FEW NOTES ON HISTORY.

(*a*) *Bill of Attainder.*—There is a fairly widespread but erroneous idea that a Bill of Attainder was *one* particular Act of Parliament.

The proceedings of Parliament in passing Bills of Attainder, and of pains and penalties, do not vary from those adopted in the cases of other Bills. Although they ordinarily commence in the House of Lords, they may be introduced in either House; they pass through the same stages, and when agreed to by both Houses, they receive the royal assent in the usual form. Generally the parties who are subjected to these proceedings are admitted to defend themselves by counsel and witnesses before both Houses; and the solemnity of the proceeding would cause measures to be taken to enforce the attendance of members. The practice is one open to the gravest objection; *first,* because Parliament constitutes itself both accuser, judge and jury, without there remaining any right of appeal; *second,* because it is a return to a comparatively unorganised condition, when in default of other arrangements the Great Council of the nation performed the functions now discharged by skilled men technically trained and attached in various capacities to our High Courts. In evil times this power of Parliament, summarily to punish criminals by special statute, has been perverted and abused, and in the best of times should be looked at askance.

Thus in the reign of Henry VIII. habitual use was made of Bills of Attainder, and the few opportunities of defence generally allowed the accused were taken away. To obviate all danger of refutation or of unpleasant disclosures, Thomas Cromwell, by the King's express command, inquired of the Judges, whether, 'If Parliament should condemn a man to die for treason without hearing him in his defence, the Attainder could ever be disputed as illegal?'

They replied that it would form a dangerous precedent, that Parliament should rather set an example to inferior courts by proceeding according to justice; but that the Court of Parliament being supreme, an attainder in Parliament could never under any circumstances be subsequently questioned in a court of law.

By the irony of fate, Cromwell was himself the *first* to perish by a Bill of Attainder being hurried through Parliament without him being heard in his defence.

Nevertheless, whenever a *fitting occasion* arises for its exercise, it is undoubtedly the highest form of Parliamentary judicature.

(*b*) *Impeachments.*—The first instance of impeachment occurred in 1376, when the Commons proceeded to impeach at the Bar of the Lords, two peers, Latimer and Nevill, and four commoners. Five of the accused were condemned. Before this date the Lords appeared to have tried both peers and commoners for great public offences, but not upon complaints addressed to them by the Commons.

In 1386, after a struggle with Richard II., the Commons vindicated their newly-acquired right in the case of Michael de la Pole, Earl of Suffolk. In 1399 the judicial power had, at the suggestion of the Commons themselves, been declared to reside in the Lords alone. During the Tudor period impeachments fell into disuse through the undue employment of Bills of Attainder and the illegal power exercised by the Court of the Star Chamber. However, it was again employed in 1621 against Sir Giles Mompesson and Sir Francis Mitchell. From 1621 to 1688 there were forty instances of its use, from 1688 to 1727 fifteen instances, and during the reign of George II. only one instance.

The following are the chief cases of constitutional importance since 1624, particulars of which our readers will do well to look out for themselves:—

1626 George Villiers, Duke of Buckingham.	Edward Russel, Earl of Orford.
1628 Dr. Roger Mainwaring.	Charles Montagu, Earl of Halifax.
1640 Thomas Wentworth, Earl of Strafford.	John , Lord Somers.
1641 George Laud, Archbishop of Canterbury.	1710 Dr. Henry Sacheverell.
1667 Edward Hyde, Earl of Clarendon.	1715 Robert Harley, Earl of Oxford.
1679 Thomas Osborne, Earl of Danby.	Henry St. John, Viscount Bolingbroke.
1681 Edward Fitzharris.	James Butler, Duke of Ormond.
1701 William Bentinck, Earl of Portland.	1788 Warren Hastings.
	1804 Lord Melville.

By the Act of Settlement, 1701, it was provided '*That no pardon under the Great Seal of England be pleaded to an Impeachment by the Commons in Parliament.*'

The liability of Ministers to be impeached is a great check upon the action of our Cabinet system, and upon the adoption of compromising courses of policy during the prorogations of Parliament.

(*c*) *A Bill of Attainder differs from an Impeachment thus:*—*Impeachment* is a judicial proceeding in which the Commons, the most solemn grand inquest of the whole kingdom, are prosecutors, supporting their accusations by evidence before the Lords as sole judges. *Attainder,* as aforesaid, is a legislative Act introducible in

SCHOLARSHIP ROUTINE FOR DECEMBER, 1891.

DAYS	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
MONDAY	Simultaneous Quadratics — Revise Domestic Economy	History from 55 B.C. to 449 A.D.	Language	Simultaneous Quadratics — Clothing and Washing	Historical Date to 827 A.D.	Language	Problems involving Simultaneous Quadratics — Savings and Investments	History from 449 to 827 A.D.	Language	CHRISTMAS HOLIDAY.		
TUESDAY	Euclid's Definitions, Axioms and Postulates — Practise Needlework	Map of Scotland	Science	Props. 1 to 4 of Euclid, Book II. — Stocking-mending	Climate and Productions of the British Possessions	Science	Deductions on Euclid, Book I. — Paper Pattern of a Plain Night Shirt	Map of United States	Science			
WEDNESDAY	Theory of Measures and Multiples	Paraphrasing	How to teach Reading	Problems in Decimal Fractions	Analysis and Parsing	How to teach Writing	Interest	Tables of the Parts of Speech	How to teach Spelling			
THURSDAY	First Four Rules of Algebra — Ingredients of Food	Write out Notes of a Lesson on '*Case*'	Mensuration of Right-angled Triangles — Problems in Vulgar Fractions	Simplifications in Algebra — Preparation of Food	History from 1688 to 1714	Mensuration of Triangles — Problems of Inverse Simple Proportion	Simple Equations — Rules of Health	History from 1714 to 1727	Discount			
FRIDAY	Deductions on Euclid, Book II. — Calico Sampler	Physical Geography of United States	History of the English Language	Props. 1 to 10 of Euclid, Book I. — Flannel Sampler	Physical Geography of Mexico and Central America	Prefixes.	Props. 10 to 20 of Euclid, Book I. — Diagram of Chemise on Sectional Paper	Phenomena of the Earth's Motions	Affixes			
SATURDAY	Language / Science / Drawing / English Composition			Language / Science / Drawing / Repetition, Literature, Penmanship			Language / Science / Drawing / English Composition					

either House. No evidence is necessarily adduced in its support. It is analogous to a '*Bill of Pains and Penalties*,' and was originally intended for the punishment of those who fled from justice. The earliest notable instance of its employment was in the banishment by Parliament of the two Despencers, A.D. 1321.

(*d*) We have arranged for a short explanation of a system of Memoria Technica to appear in the 'Pupil Teachers' Course' of this month.

For Correspondence see end of Certificate Article.

SELECTED GOVERNMENT QUESTIONS.

First Week.

1. Write a short essay on 'Colonisation.'

2. Analyse the following passage, and parse the italicised words:

They parted, ne'er to meet again.
But neither ever found another
To free the hollow heart from paining:
They stood aloof, the scars remaining
Like cliffs which had been rent asunder.
A dreary sea now flows between:
But neither heat, nor frost, nor thunder,
Shall wholly do away, I ween,
The marks of that which once hath been.

3. Draw a map of France.

4. Explain the terms — Cardinal points, horizon, meridian, plateau. Give the difference in time and the distance between two places situated on the Equator in Longitude 40° East and Longitude 40° West respectively, and state the latitudes of London, Edinburgh, Dublin, and Liverpool.

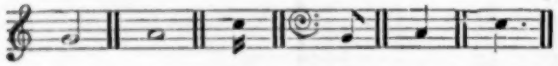
5. How would you conduct a Dictation Lesson to the Third Standard? How should the mistakes be corrected?

6. Write full Notes of a Lesson on 'Moods of Verbs.'

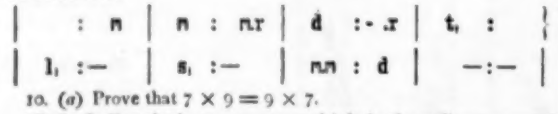
7. State briefly (*a*) the extent of the dominions of, and (*b*) the kind of authority over, their dominions possessed by three of the following—Egbert, Alfred, Canute, William the Conqueror.

8. Give the dates of landing of Hengist, Henry II.'s invasion of Wales, Battle of St. Quentin, Battle of Plassey, Indian Mutiny. Give a short summary of the events of 1884.

9. Write the pitch names and duration names of the following notes, and also the signs for the corresponding rests.



(*Tonic sol-faists.*)—Rewrite the following: (1) halving the value of every note and rest, and (2) again, doubling the value of every note and rest:



10. (*a*) Prove that $7 \times 9 = 9 \times 7$.

(*b*) In finding the least common multiple in the ordinary way of 10, 15, 30, 32, 36, why may we erase 10 and 15? Prove that your result is the least common multiple.

11. (*Men only.*) If a cube containing 31·255875 cubic ft. can be exactly contained in a cubical box whose outer edge is 1½ yds., find the thickness of a side of the box. Ans. ·19002.

(*Women only.*) If the poor rate on a house rated at 60 guineas be £2 8s. 6½d., what amount of poor rate ought to be paid on a farm rated at £1,904, when the rate is 2d. in the £ more?

Ans. £89 5s.

12. In what time will £56 5s. amount to £64 2s. 6d. at 3½ per cent. per year simple interest? Ans. 4 years.

13. (*Men only.*) Describe a square upon a given straight line. If the square be described upon the semi-diameter of another square, compare the area of the two squares.

(*Women only.*) An agricultural labourer makes 15s. a week, and has a wife and five children between the ages of 2 and 10. State clearly how much per annum he ought to spend (*a*) on bread, (*b*) animal food, (*c*) clothing, (*d*) house rent, (*e*) fuel, and (*f*) savings.

14. (*Men only.*) If a straight line be divided into two equal and also into two unequal parts, the squares on the two unequal parts are together double of the square on half the line, and of the square on the line between the points of section. Prove this without constructions.

(*Women only.*) Give a list of the articles of clothing which you would require to take with you on entering a Training College, and say what you consider the proper material for, and probable cost of, each article.

15. (*Men only.*) The perimeter of a triangle is 120 ft. and the sides are proportional to 5, 9, and 10. Find the area. Ans. $150\sqrt{14}$.

(*Women only.*) Show the importance of physical training as part of the employment of an elementary school; and describe in detail the exercises which you have found best fitted to improve the health, activity and cheerfulness of scholars, either in a girls' or an infants' school.

16. (*Men only.*) Factorise—

(*a.*) $a^{12} - 7a^6b^6 - 8b^{12}$

Ans. $(a^2 + b^2)(a^2 - 2b^2)(a^4 - a^2b^2 + b^4)(a^4 + 2a^2b^2 + 4b^4)$

(*b.*) $x^2 - 4xy - 21y^2$

Ans. $(x + 3y)(x - 7y)$

17. (*Men only.*)

$$\left.\begin{aligned} 72x + 14y &= 330 \\ 63x + 7y &= 273 \end{aligned}\right\} \text{ Ans. } x = 4,\ y = 3$$

Second Week.

1. Paraphrase this passage and parse the italicised words:—

Earth has not *anything* to show more *fair*,
Dull would he be of soul who could *pass by*
A sight so *touching* in its majesty;
This city doth *now like* a *garment* wear
The beauty of the morning. Silent, *bare*,
Ships, towers, domes, theatres and temples *lie*
Open unto the fields, and to the sky,
All bright and glittering in the smokeless air.
Never did sun more *beautifully* steep
In his first splendour valley, rock or hill.
Ne'er saw I, never felt, a calm so deep,
The river glideth at his *own* sweet will,
Dear *God!* the *very* houses seem *asleep*,
And *all* that mighty heart is sleeping *still*.

2. Give some rules for determining the case of Relative Pronouns in a sentence; and give examples of sentences containing Relative Pronouns in different cases.

3. Name four counties in England, Scotland and Ireland respectively, which are rich in minerals, and give a full account of one of the border counties of England or Scotland.

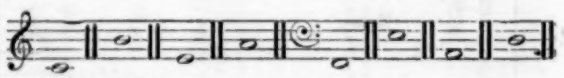
4. Describe with a sketch map the course and basin of the Amazon.

5. Explain generally how headaches and faintness may be caused by a vitiated atmosphere, and state in what part of the Schoolroom a thermometer should be placed for a proper test of the temperature.

6. Explain how diagrams, models, and other visible illustrations may be usefully employed in teaching the notations of tens and hundreds.

7. In what ways did James II. act unconstitutionally? What safeguards against like action were provided (1) on the accession of William and Mary, and (2) before the accession of the House of Hanover?

8. State briefly, giving dates, some facts of historical importance in connection with Monasteries, Universities, the Poor Laws, the National Debt, the Bank of England, the East India Company, Negro Slavery.

9. Write a major third above each of the following notes:—

(*Tonic Sol-faists.*)

d ‖ t_1 ‖ r ‖ l ‖ f ‖ r ‖ s ‖ fe ‖

10. There are 100 links in a chain which is 22 yards long; how many square links will there be in a field which contains 3½ acres?

Ans. 350,000.

11. If the price of land fall 30 per cent., so that ·15 of an estate becomes worth £1,400, find the original value of the whole estate.

Ans. £13,333⅓

12. If I transfer £1,000 from Three per Cent. stock at 92 to a Four per Cent. stock, and gain £1 5s. in income, find the price of the latter stock. Ans. $117\frac{1}{2}$

13 (*Men only.*) Write out Euclid I. 32.

SQT is a triangle right angled at Q. From S, on the side remote from T, a straight line is drawn perpendicular and equal to SQ, and a similar straight line is drawn perpendicular and equal to TQ. Show that the points PQR lie on the same straight line.

(*Women only.*) How would you spend £8 on an outfit for a girl of fifteen going to her first place who was to leave her old clothes for the children at home?

14. (*Men only.*) Write out Euclid II. 7. What is the corresponding form in Algebra?

(*Women only.*) Say how cheese is made, and what kinds of cheese contain the largest amount of nourishment.

15. (*Men only.*) Find the size of a property in acres, whose plan covers a square feet, the scale being 1 in. to 5 yards.
Ans. $\frac{a}{1210}$ acres.

(*Women only.*) Describe the efficient modes of cooking potatoes. Give your opinion as to the merits of each, and say for what dishes of meat each mode of cooking is most desirable.

16. (*Men only.*)

(*a*) $\cdot 5 - \frac{3\cdot 5x}{x-2} - \frac{24-3x}{8} = \cdot 375x.$ Ans. $\frac{5}{6}$

(*b*) $\frac{3x+2}{x-1} + \frac{2x-4}{x+2} = 5.$ Ans. 6

17. (*Men only.*) Find the H.C.F (or G.C.M.) of $x^3 - 4x^2 + 9x - 10$ and $x^3 + 5x^2 - 9x + 35$.
Ans. $x - 3$.

Third Week.

1. Point out the difference in meaning between the words in each of the following pairs, and put each word into a sentence of your own construction :—

(*a*) *Reverend* and *reverent.*
(*b*) *False* and *fallacious.*
(*c*) *Apathy* and *antipathy.*
(*d*) *Permissive* and *permissible.*
(*e*) *Benevolent* and *beneficent.*
(*f*) *Distinct* and *dissimilar.*

2. If you see anything wrong in the following sentences, correct them, and give your reasons :—

(*a*) I never remember to have seen him before.
(*b*) They deserve to receive condign punishment.
(*c*) Please to send either a written or a verbal reply.
(*d*) I intended to have pointed this out yesterday.
(*e*) He hoped everyone had enjoyed themselves.
(*f*) The climate is as good, or even better than that of Madeira.

3. Name the chief productions imported into Great Britain from her possessions in Asia, specifying the place from which each of them comes to us.

4. Where are the undermentioned places situated, and for what are they severally remarkable :—Archangel, Perim, Brindisi, Surat, The Landes, Fiji, Lagos, Buxton, Singapore, The Bermudas, Cincinnati?

5. What plan would you follow in giving a description of some famous battle? Illustrate your answer by the battle of Flodden or Waterloo.

6. In some countries the public teachers are absolutely forbidden to make use of corporal punishment in any form. Say by what other means it is possible to maintain discipline under such conditions.

7. Compare Henry II. and Edward I. with regard to (*a*) Extending the dominions of the realm, (*b*) the administration of justice, and (*c*) Relations with the clergy.

8. Name any year during which the following persons lived :—Julius Agricola, the Lady of Mercia, Waltheof, William the Lion, Saladin, Philip of Valois, and William of Wykeham.

9. Write the signatures of A major, B minor, E♭ major, F♯ minor.

(*Tonic sol-faists.*) Write the pulse signs for primary six-pulse, four-pulse, three-pulse measures.

10. Prove the rule for finding a vulgar fraction equivalent to ·345. Ans. $\frac{18}{52}$.

11. Write Notes of a Lesson on Compound Interest, taking care *to explain the reason* for each process.

12. (*Men only.*) A chessboard contains 64 equal squares, and the area of each square is 1·3225 sq. inches. The rim running round the board is $\frac{3}{4}$ inch wide. Find the length of the side of the board.
Ans. 10 in.

(*Women only.*) If £16 will maintain a family of eight persons for 11 weeks 3 days, for how long a time will £21 maintain a family of 12 persons? Ans. 10 weeks.

13. (*Men only.*) Write out Euclid I. 48. Give the corresponding formula for the square on the side subtending the obtuse angle of an obtuse-angled triangle.

(*Women only.*) What articles of clothing should not be (*a*) starched, (*b*) mangled, (*c*) long in drying, (*d*) washed with soda?

14. (*Men only.*) Write out Euclid II. 1. Prove Euclid II. 4 directly by Euclid II. 2 and II. 3 without any construction.

(*Women only.*) Give simple directions for making starch, and getting up linen collars and cuffs.

15. (*Men only.*) The radius of the inner boundary of a ring is 14 inches. The area of the ring is 100 sq. inches. Find the radius of the outer boundary. Ans. $15\frac{1}{11}$ in.

(*Women only.*) What would you do before the doctor came if a child in your school (*a*) was badly scalded, (*b*) had fainted, (*c*) had cut his arm above his elbow?

16. (*Men only.*) Write out in words what is meant by the following expressions :—

(*a*) $\frac{a^2+b^2}{4ab}$ (*b*) $\frac{\sqrt{x^2-y^2}}{x-y}$ (*c*) $\frac{\sqrt{x^2+y^2}}{\sqrt{x}+y}$

17. (*Men only.*) A dealer bought a number of calves for £80. If each calf had cost him £1 less, and he had bought 4 more, the price would have been the same. How many did he buy? Ans. 16.

—o—

LONDON MATRICULATION.

JANUARY, 1892.

OUR PREPARATION CLASS FOR PRIVATE STUDENTS.

BY T. RUSSELL MALTBY, M.A. (CLASSICAL HONOURS),
Kingswood School, Bath.

(Sixth Month.)

Candidates for Matriculation in January, 1892, should apply *at once* for Forms of Entry to the Registrar (Burlington Gardens, W.) These forms must be returned *not less than four weeks* before the commencement of the examination (Monday, January 11th), accompanied by a certificate showing that the candidate has completed his sixteenth year, and by his fee (two pounds) for the examination. So reads the regulation, but it seems that the age of candidates is reckoned up to the date of the examination; anyone therefore born before January 12th, 1876, is eligible.

We are now approaching the end of our first course of preparation. For obvious reasons our plans can only be laid for a six months' course, but for the average candidate that is not sufficient time for preparation, and our monthly schemes of work are scarcely within his compass. In our next issue we shall begin the course for June, 1892, but we advise those of our readers who hope to matriculate in January, 1893, to begin their work without delay. A large part of our notes for 1892 will bear upon their reading for 1893, and when we take up their special course next July they will find it, we hope, all the more serviceable.

I. LATIN.

Miscellaneous Notes for December.

(1) Declension of a verbal noun (*amare*)
Nom. *amare*
Acc. *amare, amandum, amatum*
Gen. *amandi*, (rarely *amare*)
Dat. *amando.*
Abl. *amando, amatu*, (rarely *amare*)

(2) Give the feminine forms of *avus, aries, asinus, Cres, equus, gallus, gener, leo, nepos, socer, taurus, Thrax, Tros.*

(3) Distinguish *ăvia, āvia; calidus, callidus; cŏlo, cōlo; expers, expertus; fēminis, fēminis;* the two words *jus; lēvis, lĕvis; pūlus, pŭlus; pedēs, pedĕs; plāga, plăga; relĕgo, relēgo; ŏvis, ōvis; lābāre, lăbāre; vŏmere, vōmere.*

(4) Distinguish the meanings of the following, according as they are substantives or adjectives:—*acer, bellum, celeres, comes, decori, fetus, fœdus, forte, jugis, nola, uber.*

(5) Do not neglect *Allen, Sects. 168, 169.* Form diminutives from *animus, caput, filia, lacrima, puer, verna.* Form adjectives from *canis, fagus, flumen, fraxinus, ignis, loquor, mons, palus, quercus.*

(6) Parse *agesis, audīn', ausit, conferti, farier, faxit, infit, isti* (verb), *norit, perpeteris, rĕperit, surrexe, venibit, vidĕn'.*

(7) To the list of correlative adverbs of place given in the *August P. T.*, add the following list of correlative adjectives:

Demonstratives.	*talis* such	*tantus* so great	*tantulus* so small	*tot* so many *totidem* just so many	*fŏtus* (rare) such in numerical order
Relatives and Interrogatives.	*qualis* of which, or of what quality	*quantus* as great, or how great	*quantulus* as small	*quot* as many, or how many	*quotus* which, or what (in numerical order)

(8) Next month we shall indicate a number of sections in *Allen* for the final revision.

Latin Course for December.

1. *Allen's Grammar, Sect. 295* to the end, if possible, but the following sections in particular—*295* and *6, 300, 301, 309, 314, 378, 387, 392.*

Five types of conditional sentences may be thus remembered—(*See Allen's Second Exercise Book*).

(*a*) If A happens, (*Pres. Indic.*)	B happens. (*Pres. Indic.*)
(*b*) If A happens, { *Fut.* / *Fut. Pf.* } *Indic.*	B will happen. (*Fut. Indic.*)
(*c*) If A were to happen *at any time*, (*Pres. Subj.*)	B would happen. (*Pres. Subj.*)
(*d*) If A were happening *now*, (*Imperf. Subj.*)	B would be happening. (*Imperf. Subj.*)
(*e*) If A had happened, (*Plup. Subj.*)	B would have happened. (*Plup. Subj.*)

2. *Allcroft and Haydon, Sects. 248-315*, especially *c. XX.*

3. *Allcroft and Haydon, Exercises XVI.* (A and C), *XVII.* (A and C), *XVIII., XIX., XX.* (A and C). Ninety sentences. (*See July P.T.*)

4. *De Bello Gallico, VI., cc. 29-44.* Write out a careful translation. Proceed with a rapid revision of Book V.

5. *Translation at Sight.*—Continued practice.

II. GREEK.

1. *Abbott and Mansfield.*—(1) Appendix II., with Revision of Nouns. (2) Revision of Adjectives, Pronouns, and Regular Verbs. (3) Appendix III. (Derivation and Composition). (4) The Vocabulary, pp. 143-151, is well chosen. The words will prove helpful for translation at sight, as well as for practice in declension and conjugation. (5) Those who have time should proceed with *A. and M.'s* Syntax, *Sects. 33-52* (Prepositions), *53-59* (The Article), *80-83* (Sequence), *93-110* (The Participle). Copy down the English of the examples, and then turn back into Greek.

2. *Parsing of Homeric Forms* in Odyssey IV.

3. *Odyssey IV., 632-847*, with written translation as before

4. *Translation at Sight.*—Continued practice.

FRENCH.

Notes on November work.

(1) What is the difference in the meanings of the following adjectives, according as they follow or precede the substantive *homme: bon, brave, fameux, gentil, grand, honnête, méchant, pauvre, petit, plaisant, triste, vilain?*

(2) What is the difference in the meaning of the following, according as they follow or precede the substantive *femme: cruelle, forte, mauvaise, maîtresse, puissante, seule, simple?*

(3) Besides *grecque, Greek*, and *franque, Frankish*, the feminines in *-que*, from masculines in *-c*, are *caduque, publique, turque.*

(4) *-s* becomes *-sse* in the following, besides *gras—bas, épais, exprès, gros, las, profès. Crasse* has no masculine.

(5) With *sot, sotte*, place *vieillot* and *bellot.*

(6) Learn the feminine forms corresponding to—*abbé, ambassadeur, bélier, bouc, canard, chat, cheval, cochon, compagnon, compère, coq, devin, dieu, dindon, doge, duc, empereur, gendre, gouverneur, héros, jars, joueur, jouvenceau, lièvre, linot, lion, loup, mari, moine, mulet, oncle, parrain, poulain, sanglier, serviteur, singe, sylphe, taureau.*

French Course for December.

1. *Breymann, Chapter V.* (from the use of *en, y, dont* as pronouns) to the end of Chapter X. (Interjections).—The whole of the chapter on pronouns should be thoroughly mastered. Take abundant practice in using the numerals. There are some important footnotes in the pages on adverbs. Learn the meanings of all the prepositions and conjunctions.

2. *Four Sets of Extracts (XX.-XXIII.).*—Written translation.

3. *Rapid Translation.*—As before.

4. *Word Lists and Phrase Lists.* — As before, with periodical revision.

III. ENGLISH.

1. In English Language the ground has now been covered. We again advise candidates to read widely, and suggest the following subjects for special study this month in *Mason, Hewitt and Beach*, or elsewhere.

(1) Special points in Syntax, *e.g.*, Adverbial Objectives, Complements, Indirect Predicates, Uses of the Subjunctive, Sequence of Tenses, Uses of the Infinitive.

(2) Hybrids.

(3) Disguised and Mutilated Forms, as *megrim, vinegar.*

(4) Changes in Latin words passing through the French.

(5) Common changes in earlier forms of English words.

(6) *The Anglo-Saxon constituents of Modern English* (learn the *classes* of words).

(7) The Five Periods of the English Language.

(8) General Rules of Punctuation.

2. *English History, 1399 to 1649, with the Geography relating thereto.*—Continue the revision and memory work, as last month.

IV. MATHEMATICS.

1. *Arithmetic.*—Revise 'tables,' the metric system, and book-work generally.

2. *Algebra*—

(1) *Capel's Handbook.* Work out a selection of the miscellaneous examples of c. XL. In c. XLI. (Evolution) read Square Root only, and work numerous examples, until the method is perfectly familiar. In c. XLII. (Inequalities) work a few examples. c. L. is an examination in book-work, and it would be well to write formal answers to a few of the questions.

(2) Plenty of practice should be taken in arithmetical and geometrical progression. *Capel's* other book contains harder examples, and these should be worked out.

(3) In addition to the commonest formulæ the following, if they can be retained with certainty, may prove very serviceable :—

$$a^4 + a^2b^2 + b^4 = (a^2 + ab + b^2)(a^2 - ab + b^2)$$

$$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

$$a(b-c) + b(c-a) + c(a-b) = 0$$

$$\left.\begin{array}{l} ab(a-b) + bc(b-c) + ca(c-a) \\ a(b^3-c^3) + b(c^3-a^3) + c(a^3-b^3) \\ a^3(b-c) + b^3(c-a) + c^3(a-b) \end{array}\right\} = \pm(a-b)(b-c)(c-a)$$

The sign to be determined by inspection.

Always proceed in cyclical order.

$$(a+b+c)(-a+b+c)(a-b+c)(a+b-c) = 2a^2b^2 + 2b^2c^2 + 2c^2a^2 - a^4 - b^4 - c^4$$

3. *Geometry*—

(1) It will be well at this stage to work fewer exercises, and make sure of the book-work. Write out an occasional proposition in full examination form—a large figure at the head of the sheet, and *one line* (however short) *for each step* in the proof.

(2) What is meant by the terms *corollary, perimeter, supplementary angles, complementary angles, alternate angles?*

(3) Work some exercises on I. 20, after this type :—To find in a given straight line AB a point C such that the sum of its distances CD, CE from two given points D, E shall be a *minimum.*

(4) Prepare a plan showing seven cases in which two triangles may be shown to be equal in every respect.

(5) In revising Book I., pay special attention to the following propositions :—5, 8, 13, 21, 24, 26, 28, 29, 32, 34, 35, 37, 43, 45, 47.

(6) Book II. should be learnt very thoroughly. Write out 4, 5, 9, 10, 11, 12, 13, 14.

(7) In Book III. pay special attention to 3, 11, 12, 14, 17, 18, 20, 21, 22, 31, 32, 33, 35, 36, 37.

V. MECHANICS.

The subject of *Hydrostatics* remains to be taken up. On the whole we recommend Hamblin Smith's (Rivingtons, 3s.; Key, 6s.). The chapters required are I. (Fluid Pressure), II. (Pressure of a Fluid acted on by Gravity), III. (Specific Gravity), V. (Properties of Air). The harder examples need not be attempted. If further reading is required we recommend Philip Magnus's Class-book (Longmans, 2s.).

VI. CHEMISTRY.

See *November P.T.*, and continue the revision.

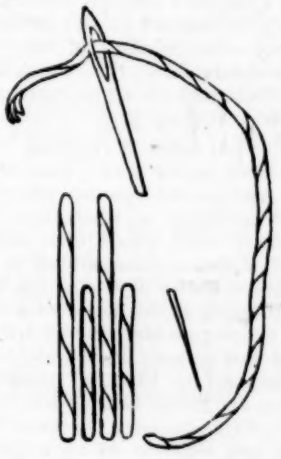
HEAT AND LIGHT.

Wallace Stewart, Light. Chapters VIII. to X.—Work out answers to most of the Matriculation questions printed in the Appendix.

DECORATIVE NEEDLEWORK.

BY MAY MORRIS.

The stitches enumerated in my last paper are by their nature adapted to soft and supple materials that hang in folds if the size and purpose of the work permit. They are also more suitably done loose in the hand, than stretched in a frame. Those that I shall describe next are stiffer in character, and more easily and smoothly done in an embroidery-frame; with some stitches, indeed, one wants both hands at liberty to manipulate the materials, this not being possible when one hand has to be devoted to holding the work.

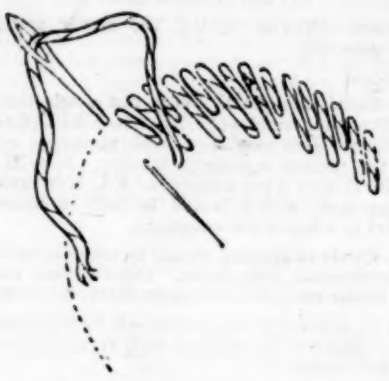


Tapestry, long-and-short, and feather stitches : These names are somewhat vague, the stitches being merely varieties of the same, but I quote them as the student will constantly hear them spoken of, or come across them in descriptions of old work. Tapestry-stitch, in effect, bears a slight resemblance to woven tapestry (hence its name I suppose). We must not, however, fall into the common error of calling the art of decorative needlework 'tapestry'; tapestry is a definite technical term for a textile wrought in a loom in a special manner; and a very ancient art it is too, and a most interesting one. This stitch is, like darning, used for filling-in broad spaces, but unlike darning, it is solid back and front (though not identical), and instead of being rather frail and loose is close and extremely durable. The worker aims at laying the stitches upright in rows (see fig 1), and when one row is done the next is laid with the stitches fitting close into those of the last row. This forms a laborious building-up of surface, simple enough where only a little shading or gradation of colour is wanted. Such a method of work was formerly, and is still, a very favourite one for embroidering figures, and here it becomes difficult as well as laborious. A faithful study of ancient figure-work,

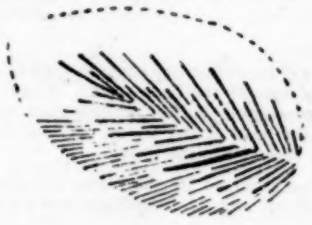
however (and early artists excelled in this branch of the art), will show that the mediæval needleworker depended greatly on his design, and that he displayed his skill every bit as much in leaving out as in putting in. We find drapery depicted by harmoniously flowing strongly-marked lines enclosing broad masses of colour ; flesh-tints, which are almost too beautiful and varied for a great painter to reproduce, are frankly and gracefully given up, and our needle artist gives us instead, well-marked features outlined with a brown or black line, the flesh itself being executed in a sort of monochrome in pinky-brown, with a very little brown shading used where absolutely necessary to mark the expression. Hair, also, is frankly conventionalised, and yet the warm masses and sunlit ringlets of nature are pleasantly interpreted by noble and simple lines and one or two gleams of bright colour. The very simplicity and harmony of such a design give what can never be attained by ill-advised attempts at needle-painting with a hundred different colours, namely, an image of beauty not marred in the interpretation. It is an old story—this wisdom of the true artist in thoroughly understanding the capabilities of his materials and tools, and asking no more of his art than it can easily and truthfully give.

It is as well to put down here what I want to say somewhere in these papers with regard to early figure-design ; those who are not familiar with the early form of art are apt to laugh at what they consider the childish simplicity with which men and women are portrayed, and, if they are accustomed to ponder over what their eyes see, they will wonder the more, comparing this rude drawing of the figure with the grace and delicacy with which rose and vine tendril or any such natural growth are drawn. It is only when the eye becomes accustomed to look for certain qualities in certain arts (not expecting, for instance, to find in an embroidered face transparency of tone or blue veins or warm depths and shadows as in a picture) that it accepts and appreciates those same qualities, and rejects work that looks more 'real' because it is full of over-confident attempts to realise what is beyond its limited power. This may sound pedantic and the student may say that he objects on principle, and as a thinking individual living in the holy nineteenth century, to accepting an oblong with a dot in the middle of it as a drawing of an eye in any art (except that of the child and mud-pie period). He may be right so far as regards modern work—though even here I am not sure, for, as aforesaid, simplicity is one of the first principles of this art. But although the mediæval artist's conception of the human figure, characteristic of early times and early beliefs, would certainly be out of keeping with the temper of latter-day design, I still hope that the simplicity and wonderful power of expression of such work will appeal to many, and that few students will turn aside from a genuine admiration of what is admirable herein to jeer at any archaism in feature-drawing. It is one of the great and serious defects of modern criticism in art not to accept the good faith and beliefs of the period under observation, and to subject every work of past times to a modern test of excellence which is itself too often defective.

I have not forgotten that we are considering a certain group of stitches, the first of which is peculiarly adapted for hangings and panels of a lasting nature, into which figures may be beautifully and effectively



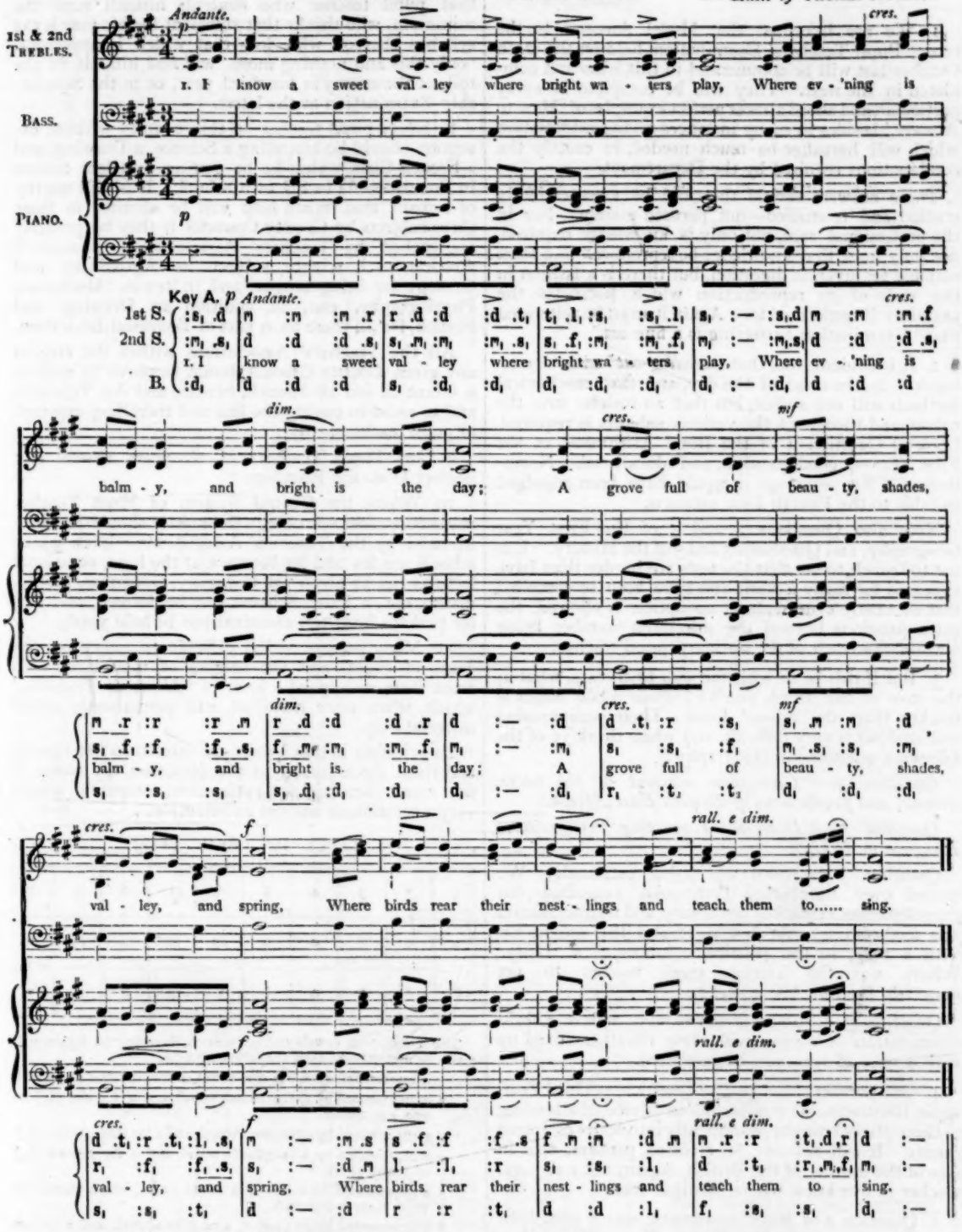
introduced. *Long-and-short* stitch and *feather-stitch* are merely variants of the same. A glance at the diagram will show that the former is well adapted to filling a broad space, starting from the outline, the stitches radiating slightly from a centre. Another row within this may be added of a different shade, but for the sake of clearness is not shown here.



In fig. 3 *feather-stitch* is shown, the stitches starting from the centre and working outwards. This form of the stitch is constantly employed in old English work of the Jacobean period, and later on into the early eighteenth century. The stitches are built up from a centre line or stem, in close and compact rows, different gradations of colour being used where needed. These slightly varying methods of employing the long-and-short stitches produce extremely thick and enduring work, I will not say as firm and close in surface as Arras tapestry, but certainly at its finest not far off. The work is usually executed in wool ; and, indeed, in silk would necessitate a quite extravagant use of this costly material, which could be better displayed in other ways.

In the old work mentioned above, these stitches are sometimes used alone, throughout the whole of an ample hanging ; in other specimens they are employed together with other and lighter stitches, often for the sake of filling the surface more rapidly. For instance, in one old hanging that I know, a great bold leaf, about a foot long, is outlined with long-and-short stitch, and the veins done in the kindred feather-stitch ; but the body of the leaf is filled with a crabbed, loose stitch, similar to the *looped* feather-stitch described in a former paper. The whole piece of work is a wildly eccentric assembly of different stitches, and has quite an interesting individuality, for its workers must have taxed their invention to produce variety in a spirit of impatience at monotony and plodding.

SWEET VALLEY.

Music by THOMAS MURBY.

Andante.
1st & 2nd TREBLES.
BASS.
PIANO.
1. I know a sweet val - ley where bright wa - ters play, Where ev - 'ning is
balm - y, and bright is the day; A grove full of beau - ty, shades,
val - ley, and spring, Where birds rear their nest - lings and teach them to..... sing.
cres.
dim.
mf
f
rall. e dim.
Key A.
1st S.
2nd S.
B.

2. There stands a neat cottage with woodbine entwined,
And sweet honey-suckles and lilacs you'll find;
There peace dwells with freedom, there foes are not feared,
There childhood is cherished, and age is revered.

3. There hearts true and faithful their joyful songs raise,
And make of the hearthstone an altar of praise:
Oh, sweet is the valley where bright waters play,
To soothe the cool evening, and gladden the day.

PUPIL TEACHERS' COURSE.

1. We are informed that Model Answers to the recent Pupil Teachers' Examination held on the 24th October last will be commenced in this issue and completed in the next. They will be complete in every particular, and afford almost perfect examples of 'How to Answer,' besides in many instances giving information which will hereafter be much needed, in exactly the combinations required by the Department.

These answers should therefore be most carefully studied and re-studied—not perused merely. For in the professional race, not only is knowledge required, not only must that knowledge be reproduced in a form suitable for juvenile digestion, but there is a fashion in the style of its reproduction which fascinates the examiner if conformed to. Again it must be reiterated that 'Examination-answering is a fine art.'

2. It is evident, too, that '*weeding-out*' and '*screwing-up*' is the order of the day, and that mechanical methods will not suffice, but that an insight into the nature and theory of the various subjects is required. Look at Question 4 of the Boys' Arithmetic of the First Year—a good question, and educational. Nevertheless, a few years ago it would have been adjudged suitable to the Fourth Year veterans.

Note also Questions 2 and 5 of the First Year Geography, and Questions 3 and 5 of the History. It is not too much to say that the tests are harder than have appeared for many a year, and have been so compiled that in nearly every subject no option is allowed, the extra questions beyond the minimum number being outside the reach of the ordinary pupil teacher.

3. But if this be so with the two first years, what is the case of the third year's? Their little finger is thicker than the others' loins. Their paraphrasing and analysis is very difficult, and what think ye of the following questions in Geography?

Question 3.—'*Give some account of the races, climate, and productions of British East Africa.*'

Question 5.—'*Describe a coasting voyage from Rangoon to Pekin.*'

Question 3 exercised our mind extremely. We turned over numberless text-books, consulted our encyclopædias, ransacked our library, and no information was forthcoming. At last we found the sought-for, with a map, in the political columns of a 'Daily.' Where was the average pupil teacher to get materials from for his answer?

Question 5 is also out of the way, unless a bald enumeration of capes, gulfs, river mouths, mixed up with a spice of romance, be permitted.

4. One portion of Geography Question 4 (Third Year) again illustrates our multitudinous advice of attending to those places brought prominently into notice by recent events. It will scarcely be credited, perhaps, that in face of the murder of the British Agent, not one pupil teacher in five knew where Manipur was.

5. Question 2 of Boys' Arithmetic was a pitfall for the majority; and in the History Paper (Third Year again), Questions 4 and 5 were quite difficult enough for Second Year Certificate Papers.

6. Question 2 (*b*) of Teaching appears a trifle puerile.

7. From the foregoing remarks it will appear that that pupil teacher who contents himself with the minimum, who thinks that sufficient for his year is the syllabus thereof, who does that which is appointed, 'only this and nothing more,' will find himself in the toils of the enemy in his third year, or in the Scholarship Examination at the latest.

8. Every pupil teacher in this country without exception should be attending a Science, a Drawing, and a French Class, unless he be getting excellent tuition in these subjects in his own school. It is well worthy of remark that much help will be afforded in these three subjects by County Councils if they be properly approached by Teachers' Associations. In country districts such science subjects as Agriculture and Geology are being taught, and in towns, Mechanics, Physiography, etc., in addition to Drawing and French, for all these form part of Technical Education.

All the Teachers' Associations within the area of any given County Council should combine to request a Grant in aid of French, Science and Art Teachers, and to assist in paying the fees and travelling expenses of pupil teachers.

9. Girl Pupil Teachers of all years should not neglect Domestic Economy.

10. Where the Central System of Pupil Teacher instruction does not obtain, the matter should be taken in hand by the Teachers' Associations. Even where schools are few and far between, at the least, occasional lectures can be given on Pedagogy, Grammar, Mathematics, etc., a Prize Scheme can be formed, and two (or perhaps four) test examinations be held yearly.

11. Many persons find it difficult to remember the dates of events and the heights of mountains. To assist these we append a form of '*Memoria Technica*,' which, when once mastered, will permanently afford material help.

Its principle is that letters are substituted for figures, and these are attached to a contraction, the name of the event forming an outlandish compound whose very uncouthness ensures its retention.

TABLE OF 'MEM. TECH.'

1	2	3	4	5	6	7	8	9	0
a	e	i	o	u	au	eu	oo	ou	w
b	d	t	q	l	x	p	k	n	v

The letters, both vowels and consonants, denoting the figures will easily be remembered from the following aids:

1 is represented by *a*, the *first* vowel, and *b*, the *first* consonant.

2 is represented by *e*, the *second* vowel, and *d* for *duo* (L.) = two, *e.g.*, *double*.

3 is represented by *i*, the *third* vowel, and *t* for three, or *tres* (L.).

4 is represented by *o*, the *fourth* vowel, and *q* for *quatuor* (L.) or *quatre* (Fr.).

5 is represented by *u*, the *fifth* vowel, and *l*, which stands for 50 in Roman numerals.

6 is represented by *au* (*a* = 1, *u* = 5, as above), and *x* for six (Eng.), *sex* (L.), *hex* (Gr.).

7 is represented by *eu* (*e* = 2, *u* = 5, as above), and *p* for *sept* (L.), *hept* (Gr.).

PUPIL TEACHERS' ROUTINE FOR **DECEMBER.**

DAYS	YEARS	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
		1st Lesson	2nd Lesson	3rd Lesson	1st Lesson	2nd Lesson	3rd Lesson	1st Lesson	2nd Lesson	3rd Lesson	1st Lesson	2nd Lesson	3rd Lesson
MONDAY	1	Analysis and Parsing	How to teach Spelling	Revision of Vulgar Fractions	Analysis and Parsing	How to teach Reading	Any Revision	Analysis and Parsing	Subtr. of Algeb. Knitting Socks	Map of Scotland	Analysis and Parsing	Revise Algebra Stocking-hole mending	Geography of Australia
	2			Method of Unity Vulgar Fractions of Money					Multip. of Algeb. Knitting Stocking	Map of Italy		Revise Algebra Flannel Patch	Geography of India
	3		How to teach History	Stocks—Short methods with Repeaters		How to teach Arithmetic			Divis. of Algebra Cross Cut Darn	Map of South Africa		G.C.M. of Algebra Hedge-tear Darn	Geography of Asia
TUESDAY	1	Revise any Euclid or Needle-work	Any Geography	Scripture, or Revision	Revise any Euclid or Needle-work	Multip. of Vulgar Fracts. of Weights and Measures	Scripture or Revision	Euc., Bk. I. Prop. 3 Paper Patterns of Garments	Divis. of Vulg. Fract. Add. and Subt. of Vulg. Fct.	Scripture or Revision	Euc., Bk. I., Prop. 4 Paper Patterns of Garments	English from Text Book	Scripture or Revision
	2		Longitude			Method of Unity Abstract Vulgar Fractions		Euc., Bk. I., Prop. 5 Paper Patterns of Garments	Theory of req. Rules		Euc., Bk. I., Props. 6 & 7. Paper Patterns of Garments		
	3		Winds			Square Root Simple Practice		Euc., Bk. I., Props. 33, 34. Paper Patterns of Garments	Mensuration of Triangles. Abstract Vulg. Fra t.		Euc., Bk. I., 35 36 Paper Patterns of Garments		
WEDNESDAY	1	History from 787 to 901 A.D.	English from Text Book	Any Advanced Work	Revise History	Prefixes, Roots, or Affixes	Any Advanced Work	History from 901 to 1012 A.D.	Literature, Repetition, and Writing	Any Advanced Work	Dynastic Tables	Composition or Paraphrasing	Any Advanced Work
	2	History from 1189 to 1216 A.D.			History from 1216 to 1270 A.D.			History from 1270 to 1307 A.D.			History from 1307 to 1327 A.D.		
	3	History from 1572 to 1602 A.D.			History from 1602 to 1624 A.D.			History from 1624 to 1637 A.D.			History from 1637 to 1649 A.D.		
THURSDAY	1	Geography of British North America	Compound Practice	Literature, Repetition, and Writing	Geography of British North America	Dates from 410 to 787 A.D.	Composition or Paraphrasing	Geography of Scotland	Any Revision	Lives of Historical Personages	Geography of Scotland	Multip. of Algebra Stocking-hole Mending	Literature, Repetition and Writing
	2	Geography of India	Division into prop. parts. Proofs of Vulg. Fract. rules		Geography of Europe	Dates from 1189 to 1270 A.D.		Geography of Europe			Geography of Europe	Easy Algebraic Factors Print Patch	
	3	Geography of Africa	Stocks		Geography of Africa	Dates from 1572 to 1624 A.D.		Geography of Africa			Geography of Africa	L.C.M. of Algebra Cross-cut Darn	
FRIDAY	1	Problems in Addition and Subt. of Vulgar Fract.	Any Advanced Work	Any Advanced Work	Simple Practice	Any Advanced Work	Any Advanced Work	Add. and Subt. of Decimals Household Accounts	Any Advanced Work	Any Advanced Work	Problems in Vulg. Fract. Diff. kinds of Fract.	Dates from 787 to 901 A.D.	Any Advanced Work
	2	Method of Unity Vulgar Fractions of Money			Theory of Propor. Any abstract Vulgar Fractions			Averages Abstract Decimals			Averages Abstract Repeaters	Dates from 1270 to 1327 A.D.	
	3	Discount. Theory of Repeating Decimals			Stocks Money Decimals			Problems of Motion Compound Practice			Mensuration of Triangles. Abstract Decimals	Dates from 1624 to 1649 A.D.	
SATURDAY	1	Language	Science	Drawing	Music	Language	Science	Drawing	Music	Language	Science	Drawing	Music
	2												
	3												

δ is represented by *oo* (*o* = 4, *o* = 4, as above), and *k* for *okto* (Gr.), *octo* (L.).

g is represented by *ou* (*o* = 4, *u* = 5, as above), and *n* for nine (Eng.), *novem* (L.), *ennea* (Gr.).

o is represented by *w* (*u* = 5, *u* = 5, as above), and *v*.

A list of dates now may be compiled by any reader (the thousands being omitted) thus:

Battle of Hastings, 1066	= Hastaux . .	*aux*	= 66
Ely surrendered, 1071	= Elypa . . .	*pa*	= 71
Battle of Tenchebra, 1106	= Tenchavau .	*avau*	= 106
Magna Charta, 1215	= Magebu . .	*ebu*	= 215
Wat Tyler's insurrection, 1381 . .	= Watika . .	*ika*	= 381
Columbus discovered America, 1492	= Colone . .	*one*	= 492
The Spanish Armada, 1588 . . .	= Armlook . .	*look*	= 588
Habeas Corpus, 1679	= Habaupou .	*aupou*	= 679

A FEW SUITABLE QUESTIONS.

First Year.

1. *Boys.*—Find, without converting to Vulgar Fractions, the sum of ·49, ·047, ·1463. Ans. ·0587041.

Girls.—What fraction added to $1\frac{4}{5} + 3\frac{1}{3} + 5\frac{7}{15}$ will make a sum total of 12. Ans. $1\frac{1}{15}$.

2. *Boys.*—One person bought $\frac{4}{5}$ of a share in a mining company, and another bought $\frac{5}{6}$ of a share in the same company. If they paid £220 between them, find how much each of them paid. Ans. £108; £112.

Girls.—Find by Practice the value of 2 qrs. 7 ozs. 9 drs. at 18s. 6d. per lb. Ans. £52 4s. 8¾d.

3. Write in large hand as a specimen of copy-setting the word *Typographically*.

Write in small hand as a specimen of copy-setting the words

'*Then none were for a party,*
But all were for the State.'

4. Analyse the following passage, and parse the italicised words:

O *sovereign* of the *willing* soul,
Parent of sweet *and solemn-breathing airs*,
Enchanting *shell!* The *sullen Cares*
And frantic Passions *hear thy* soft *control.*

5. Write an account of 'King Alfred and the cakes.'

6. What Teutonic affixes denote diminutiveness, the agent, condition, origin and quality of?

7. Draw a map of the Eastern Coast of Scotland, putting in rivers, capes, bays, and ports.

8. Describe the mountain system of Ireland.

9. What do you know of the History of Mercia?

10. Give dates of battles of Caer Caradoc, Mount Baden, Brunanburh, and Stamford Bridge. What important events are connected with the dates 121, 210, 991?

11. What are the intervals between each note of the common scale?

Second Year.

1. *Boys.*—The readings of a thermometer for a week were 58·7°, 54·6°, 53·8°, 56°, 52·9°, 53·2°, and 59·3°. Find the average temperature. Ans. 55·5°.

Girls.—Express 17 yards 1 ft. 7½ ins. in terms of half a mile. Ans. $\frac{1}{11}\frac{1}{1}\frac{1}{1}\frac{1}{0}$.

2. *Boys.*—If 1d. per week be paid for the loan of 8s. 8d., what is the rate per cent. per annum? Ans. 50 per cent.

Girls.—If a man walk 93½ yards in ¾ minutes, how long will he take to walk $\frac{3}{8}$ of a mile at the same rate? Ans. 54 seconds.

3. Writing as in first year.

4. Describe the Mountain System of Hindostan.

5. Draw a map of Italy.

6. Paraphrase the subjoined passage:

Near yonder copse *where once* the garden smiled,
And *still* where *many* a *garden* flower grows *wild*,
There, where a few *torn* shrubs the *place* disclose,
The village *preacher's* modest mansion rose.
A *man* he was to *all* the country *dear*,
And *passing rich* with forty pounds a *year*.

7. Analyse the foregaing passage and parse the italicised words.

8. What are the different forms assumed by the Latin prefixes *con-* and *sub-*?

9. Enumerate the chief battles from 1066 to 1327, giving dates.

10. What do you know of the Crusades? What English Princes took part in them?

11. Write out the major scales of one sharp and one flat, and eight bars or measures of ⅜ time.

(*For Tonic sol-faists.*)—Describe the mental effects of the notes of the scale. Write out a few measures of three pulses each.

12. How would you conduct a Dictation lesson?

13. Give the Past Definite of *Être* or decline *Dominus* and *Leo*.

14. *Boys.*—Write out *from memory* Euclid I., 5.

Girls.—Describe the knitting of a stocking-heel.

Third Year.

1. *Boys.*—I received £877 12s. 6d. for a loan made four years ago at 4½ per cent. per annum. Find the amount of the loan. Ans. £737 10s.

Girls.—Find the value of $\frac{49{\cdot}231 \times {\cdot}00728}{{\cdot}0000789}$ to four places of decimals. Ans. 4542·4801.

2. *Boys.*—A square field contains 3 acres 2 rds. 7 pls. 9¼ yds. Find the length of its side. Ans. 131 yds.

Girls.—A wins a race of 100 yds. from B by 17 yds., and from C by 8 yds. How many yds. start ought C to give B in 200 yds., that they may run a dead heat? Ans. 19⅛ yds.

3. Writing as in Second Year.

4. Paraphrase—

I bring fresh showers for the *thirsting* flowers,
From the seas *and* the *streams;*
I bear light shade for the leaves *when laid*
In *their* noonday dreams.

From *my* wings *are shaken* the *dews that* waken
The sweet buds *everyone*,
When *rocked to rest* on their mother's breast
As she dances *about* the sun.

5. Analyse the foregoing passage and parse the italicised words.

6. What are the meanings of the following Latin roots; give three English words containing each of them—*amo, annus, dominus, pleo, sisto, vivo?*

7. Draw a map of Cape Colony, and describe the climate of that possession.

8. Enumerate the countries of Africa, giving the productions of each.

9. Give the dates of death of Ridley; Ratification of the 39 Articles; Establishment of the East India Company; Petition of Right; Execution of Charles I.; Great Fire of London.

10. Trace the descent of James I. from Edward III.

11. Write down the various time notes with their corresponding rests.

(*For Tonic sol-faists.*)—Write out eight measures in four pulse containing half-notes, and then re-write it in two pulse-measure.

12. Write notes of a lesson on '*Prepositional Phrases.*'

13. Give the Imperfect Indicative of *Boire* or *Moneo* and *Rego*.

14. *Boys.*—Write out *from memory*, Euclid I., 32.

Girls.—Describe the method of darning a hedge-tear.

15. *Boys.*—Solve $\frac{2x-3}{3x-4} = \frac{{\cdot}4x-{\cdot}6}{{\cdot}06x-{\cdot}07}$ Ans. $x = 1\frac{1}{2}$.

Girls.—What do you know of the process of bread-making?

16. *Boys.*—The side of an equilateral is 2 ft. 6 ins., find the height. Ans. 25·98 nearly.

For Fourth Year Questions see end of Scholarship Article.

For Correspondence see end of Certificate Article.

MODEL ANSWERS TO PUPIL TEACHERS' QUESTIONS.

OCTOBER, 1891.

FIRST YEAR.

English Grammar and Composition.

BOYS AND GIRLS.

1. Parse and analyse these lines:—

'*Long looked the anxious Squires: their eye*
Could in the darkness nought descry.'

SENTENCE	KIND OF SENTENCE	SUBJECT	PREDICATE	OBJECT	EXTENSION OF PREDICATE
Long looked the anxious Squires	Princ.	the anxious Squires	looked		long
Their eye could in the . . descry	Princ.	their eye	could	[to] descry nought	in the darkness

Long—adv. of duration, mod. *looked.*

looked—verb, reg. (strong), intrans., indic., past defin., plur., 3rd pers., agrees with its subject *Squires.*

[A transitive verb agrees with its subject in number and person.]

the—def. art., points out *Squires.*

anxious—adj., posit., qual. *Squires* attributively.

Squires—com. noun, plural, 3rd, masc., nom., subject to *looked.*

their—pers. pro., plural, 3rd, com., poss., qual. *eye.*

eye—com. noun, sing., 3rd, neut., nom., subj. to *could.*

could—verb, irreg. (strong), defective and indeterminate, trans., act., indic., past. defin., sing., 3rd pers., agrees with its sub. *eye*, and gov. [*to*] *descry.*

[A trans. verb agrees with its sub. in numb. and pers.]

[*Could* is an indeterminate verb, requiring a prolative verb after it. *Could* cannot be in the passive voice.]

in—prep., gov. *darkness.*

the—def. art., points out *darkness.*

darkness—com. noun, sing., 3rd, neut., obj., gov. by *in.*

[Prep. gov. nouns and pronouns in the objective case.]

nought—indef. pron. (neg.), sing., 3rd, neut., obj., gov. by to *descry.*

[*to*] *descry*—verb, reg. (weak), trans., act., infin., pres., gov. by and prolative to *could*, and gov. *nought.*

[Transitive verbs gov. nouns and pronouns in the objective case.]

[A verb in the infin., used substantively, may be gov. by a trans. verb.]

[Some verbs such as *can* are only able to gov. a noun or pronoun through the medium of an interposed infin. Such infinitives are called prolatives.]

2. What is the meaning or use of the final letter or syllable in the following words:—Hi-*s*, clear-*er*, wid-*en*, child-*ish*, my-*self*, rivu-*let*, who-*m*?

hi-s—the *s* is the genitive inflection (*es*) of the Anglo-Saxon pronoun, *he, heo, hit.*

clear-er—The *er* is the comparative inflection from the A.-S. *re.* Compare Latin *ior.*

wid-en—en is a causative verbal suffix, *cf. lengthen, sweeten.*

child-ish—ish, A.-S. *isc*, means having some touch of a quality or thing. Compare German *sch.* By some grammarians the form *sweetish* would be called in the sub-positive degree.

rivu-let—let has a diminutive force.

who-m—m is the sign of the accus. or obj. In A.-S. it was the dative form, as was also *him.*

3. Make sentences of your own, containing:—*(a) An Adverbial Phrase, (b) A Demonstrative Adjective, (c) An Infinitive of Purpose, (d) A Participle used as a Noun.*

(a) I followed *immediately after the soldiers.*

(b) *That* man is *this* woman's husband.

(c) I went *to buy* a bun.

(d) The *dying* uttered fearsome groans.

4. What is meant by the Passive Voice of a Verb? Give some examples, and say what kind of verbs (if any) cannot be put in the Passive Form.

The passive voice of a verb is that form it assumes when the object of the active voice becomes the subject; and the subject (if expressed at all) is put in a prep. phrase of instrumency or agency. It is compounded of the required tense of the verb to be, and the indefinite past passive participle of the principal verb.

As intransitive verbs cannot govern objects, they cannot be put in the passive voice, except when they take a cognate object.

Indeterminate verbs such as *can, may, must* cannot be placed in the passive.

ACTIVE.	PASSIVE.
1. The dog bites the boy.	1. The boy is bitten by the dog.
2. I taught him drawing.	2. Drawing was taught him by me. He was taught drawing by me.

5. Explain the terms *Intransitive, Indefinite, Infinitive*, as used in English grammar?

Intransitive from *in* = *not*, and *transitus* = *a passing over*, is a term employed to denote that kind of verb in which the action is completed without 'passing over' to an object.

Indefinite from *in* = *not*, and *definitus* = *limited, bounded*, or *distinct*, is used to describe articles, adjectives, and pronouns, etc., which are not specific in their application.

Infinitive from *in* = *not* and *finitus* = *bounded*, serves to name that mood of a verb which, having no subject, is not bounded by number and person.

Geography.

BOYS AND GIRLS.

1. Give in tabular form the manufactures of Newcastle-on-Tyne, Bradford, Sheffield, Derby, Dublin, Belfast, Stoke-on-Trent, Dundee and Norwich.

TOWNS	MANUFACTURES
Newcastle	Cannon, Glass, Shipbuilding.
Bradford	Woollen.
Sheffield	Cutlery.
Derby	Silk, Cotton, Hosiery.
Dublin	Porter, Beer, Poplin, Linen.
Belfast	Linen.
Stoke	Earthenware.
Dundee	Linen, Fruit Preserves.
Norwich	Silk, Worsted, Shawls.

2. Describe briefly a journey by rail from Montreal to Vancouver.

Starting from Montreal, the city of churches, just below the confluence of the Ottawa with the S. Lawrence, we embark on the Canadian Pacific Railway and journey almost due west over a country nearly flat and fairly thickly peopled. Here the lumberer is still at work, but not so busily as in days of yore. After a journey of nearly 400 miles over the older and more settled provinces we skirt the shores of Lake Superior, and trending a little to the North, pass the Lake of the Woods into Manitoba, where the miles and miles of cornfields attest alike the native fertility of the soil, and the industry of Scotch and English settlers. Next we cross the S. Saskatchewan River and begin to climb the continental mountain axis south of Mounts Brown, Hooker and Murchison, cleverly choosing the lower part of the valley of the Fraser for the steeper, downward and western grade. In the final stages we may observe a considerable amount of mining and salmon-fishing going on. The principal stations after Quebec are Montreal, Ottawa, Renfrew, Port Arthur, Ignace, Winnipeg, Brandon, Qu'Appelle, Regina, Maple Creek, Calgary, Stephen (on the summit of the Rockies), Port Moody and Vancouver. From Montreal to Vancouver is about 2,700 miles.

3. Give some account of the plant and animal life of Australia, and of its mineral products.

The Plant Life of Australia is peculiar. The forest contains enormous trees, many of them yielding gums. A great proportion of the trees are evergreen, palms are found in the north, and immense grasses and ferns abound. There are fruits shaped like pears, but of solid wood, and cherries with the stones outside. European plants and trees, etc., thrive marvellously.

The Animal Life is just as singular. There are pouched animals such as the kangaroo, opossum and wombat, and there is a strange quadruped, web-footed and billed, which lays eggs, called the ornithorhyncus. The birds comprise parrots, cockatoos, emus and black swans. Reptiles are not numerous, but fish abound off the coasts.

Mineral Products are profuse and widely distributed. Gold is abundant in all the provinces except South and West Australia. Copper and lead are much worked in South Australia. In most of the colonies iron is plentiful, but is at present not much worked. Coal, tin, and marble are also found.

4. Draw a map of the Basin of the Thames, or of the Southern Counties from North Foreland to Portland Bill.

See any good atlas.

5. Give some account of (1) The Canadian Lumber Trade; (2) The Australian Pearl Fishery; and (3) Gold-digging.

(1) *Canadian Lumber Trade.*—Lumbering or logging is carried on in all the provinces, but more especially in Ontario and New Brunswick. The valley of the Ottawa is *the* lumber district. The forests belong to the government, so that the lumbermen must first obtain a licence. Scouts are sent out to discover the finest tracks. A log hut is erected, and supplies secured in Autumn, so that felling may commence as soon as the sap descends. White pine has to be selected with great care, as many trees are unsound. Red pine is always sound. The trees rise forty or fifty feet without a branch, like giant masts. After being cut down the trunks are rolled into the frozen streams to await their melting, at which time they are floated down in rafts to various lumber factories, containing immense saws worked by water power. There are many thousands of these huge mills, each turning out annually hundreds of thousands of logs. Guiding the logs down the rivers is wild work, full of adventure.

(2) *The Australian Pearl Fishery.*—This branch of industry is followed both on the western and eastern shores of Australia. The chief beds of oysters in the latter instance lie between the Great Barrier Reef and the shores of N.E. Queensland. In Western Australia alone 150 tons, worth £200 per ton, are secured annually. The methods employed are, first, similar to those used in the Ceylon fishery, viz., small boats and divers; and, second, steam-dredging.

(3) *Gold-digging* is the generic name for the employment of all seeking gold from the soil, although sometimes there is no digging about it, but simply the washing of river sands and the waters of cavern streams. In this latter case small nuggets are often found, and the metallic sand is often rudely smelted over charcoal furnaces. In the auriferous regions the yield is often so rich that the favoured ground is apportioned into minute spaces, which are jealously guarded and worked. At first gold was chiefly found in nuggets, many of these being of large size, but this has now given place to quartz-crushing.

Composition.

BOYS AND GIRLS.

This passage was read distinctly twice, and then its substance had to be reproduced from memory:—

Telegraph wires were for the first time set up in a country in South America, and the Governor was anxious to prevent their destruction by the natives. Calling a number of them together, he told them that on no account must they touch the wires. 'If you do,' he said, 'your hands will be held and you will be unable to get away.'

The natives smiled, and now was the Governor's opportunity. He asked a number of them to take hold of the wires fixed to a telegraph battery which was in full working order. The natives got a good shock, and were quite convinced that it was dangerous to touch the wires.

The Governor requested them not to tell anyone. However, the news soon spread, and from that time no wire was broken or injured in any way by the natives.

Penmanship.

BOYS AND GIRLS.

Write in large hand the word *Demography*, and in small hand '*The fishermen that walk upon the beach.*'

Needlework.

GIRLS ONLY. (*One hour allowed.*)

1. Cut out and tack together the upper part of a girl's chemise.
2. Make a button-hole, and sew on a button.

History.

BOYS AND GIRLS.

1.—Picts, Scots, Jutes, Angles, Saxons. What do you know of the original homes and subsequent settlements of any of these?

The Picts.—There is no trustworthy account of where the Picts originally dwelt before their settlement in Scotland, and it is not even known whether they were Celtic or Teutonic, although opinion inclines to the former. The country of the Picts was bounded on the south by the Firth of Forth and the province of Lothian, then in possession of the English.

The Scots were a Celtic people from the North of Ireland, who under their leader Fergus succeeded in establishing themselves in Argyle, and who quickly extended their dominion northwards. Their southern boundary was the Firth of Clyde and the kingdom of Cumbria, the territory of independent Britons.

The Jutes dwelt in the fifth century of our era in the province of Jutland and the neighbouring Baltic isles. Doubtless also with them were associated many Scandinavians. About 455 A.D., certain Jutes under Hengist and Horsa landed near Ramsgate, and after defeating the Picts for the Britons, determined to stay in their new quarters, and finally they occupied Kent, South Hampshire and the Isle of Wight.

The Angles inhabited the province of Sleswick and part of Holstein, and although the last to come over, emigrated in such numbers as almost to denude their native land. They founded the kingdoms of East Anglia, Deira, Bernicia, and Mercia between 547 A.D. and 586 A.D. Their dominion extended from the Forth to the kingdom of Essex.

The Saxons came from the southern portion of Holstein, and from the lower courses of the rivers Elbe, Weser, Ems and Rhine. Between 476 A.D. and 527 they established their kingdoms of Sussex, Wessex and Essex.

2. Say what you can as to the life and extent of power either of Egbert *or* Athelstan.

Egbert was of the royal family of Wessex. On the death of Alchmund (the former king), Brihtric, a powerful noble, succeeded in ousting Egbert, who had the best claim to the throne. The latter thereupon sought refuge, first with Offa of Mercia, and afterwards with Charlemagne of France. In 800, at the death of Brihtric he succeeded him, and by 827 had reduced all the other kingdoms, enfeebled by constant strife, to acknowledge him as more than their nominal over-lord. His sway covered the whole island south of the Forth, with the exception of Wales and the counties of Cumberland, Westmoreland and Cornwall. He died in 838 A.D.

Athelstan succeeded his father, Edward the Elder, in 925. Although illegitimate, his age and talents caused him to be preferred to the lawful children. He was victorious over the Danes of Northumberland and the Scots. He also forced the Welsh beyond the Wye and the Cornish beyond the Tamar. In 937, the Norwegians, Danes, Irish, Scots and Britons all leagued against him, but were defeated at the sanguinary and decisive battle of Brunanburh. After this he governed in peace and with great ability until his death, 940 A.D. The extent of his dominions is given above.

3. What are the chief authorities for the early history of England? Write what you know of any of them.

The chief authorities are Cæsar's Commentaries, Tacitus' Annals, Gildas, The Venerable Bede, Ina, Alfred, etc. Herodotus (B.C. 450), Aristotle (B.C. 350), Polybius (B.C. 150), and Strabo (A.D. 25) also mention these islands. Modern authorities are Kemble, Stubbs, Palgrave, Freeman, and in the twelfth century, Henry of Huntingdon and William of Malmesbury.

Julius Cæsar was born B.C. 100, and commanded the Roman fleet at the early age of 22. During the next 16 years he practised oratory, allied himself with Pompey, and coquetted with the conspiracy of Cataline, filling successively the offices of military tribune, quæstor, edile, pontifex maximus, and prætor. He next governed Spain and conquered Gaul, the reduction of which latter country he records in his Commentaries. In B.C. 55 and B.C. 54 he invaded England, but falling out with Pompey 49 B.C. he marched to Rome, and the next year he defeated his rival at the decisive battle of Pharsalia. Five years later he was assassinated by Brutus and Cassius in the fifty-sixth year of his age.

The Venerable Bede was born about 673 in the neighbourhood of Wearmouth, and was educated in its monastery until the nineteenth year of his age, when he was ordained deacon. In his thirtieth year he took priest's orders, and he spent the remainder of his life in increasing his own knowledge and instructing others. He translated the Gospel of S. John into Saxon, but his most important work is the 'Ecclesiastical History of the Nation of the Angles.' He died in 735.

4. Witan, Earl, Churl, Alderman, Sheriff, Thane, Villein. Explain these terms as well as you are able.

Witan, or *witena-gemót*, was the Meeting of the Wise, the Teutonic national assembly, the progenitor of our own Parliament. Its members were the King, the Aldermen, the king's Thanes, the Bishops, the Abbots, and generally the *principes* and *sapientes*. Its powers were as extensive as those of Parliament at present.

Earl (from the Danish and Icelandic *jarl*) is now a nobleman third in rank, the grades running as follows—Duke, Marquis, Earl, Viscount. The Earls under Knut and Edward the Confessor were the highest noblemen, and ruled, under these monarchs, vast portions of England; thus Tostig was Earl of Northumbria.

Churls, or *ceorls*, were, broadly speaking, all those who were not *Earls* (*Eorls*). But among them were various grades, according to the relations which they bore towards the *hlaford*. The landless *ceorls* were, except in the matter of choosing their *hlaford*, little better off than the *servi*, *serfs*, or *slaves*. They are spoken of in Domesday Survey as *liberi homines*, *socmanni*, etc.

Aldermen.—The Aldermen were higher than Thanes, and were at first chiefs of their tribes. From the time of Egbert they were magistrates or viceroys appointed by the king to govern shires or large districts. In the 11th century the Danish title *earl* supplanted *earldorman*, which latter term is now used to distinguish members of City and County Councils not elected by popular suffrage but by the Councillors themselves.

Sheriff (*scir-gerefa*, *shire-reeve*), along with the earldorman and bishop, presided over the *shire-gemót*, and had to carry out the decisions of the court, levy fines, collect taxes, etc. He represented the central authority.

Thane (*thegn*).—Both the king and earldormen were surrounded by followers or *gesithas*, similar to the *comitatus* described by Tacitus. In progress of time service to the king or some great lord became the chief avenue to nobility, and the word *thegn* itself became synonymous with *noble* or *gentle*.

Villein is a term of no precise signification, as it attached sometimes to the landless *ceorl*, and at other times to the actual slaves (*theowas*, *esnas*).

5. Name some of the English towns that were important during the first ten centuries, and show how they became so.

London, York, Chester, Canterbury, Dover, Winchester, etc.

London was a Roman colony, the most popular city, often the seat of government, and possessed the greatest commerce.

York was a Roman colony, the capital of northern England, the basis of operations against Scotland, and is admirably situated on the Ouse.

Chester, well placed upon the Dee, was a Roman colony, a curb upon North Wales, and a famous Danish city.

Canterbury, in the earliest founded Saxon kingdom, gradually arrogated to itself ecclesiastical supremacy.

Dover rose into importance because of its proximity to France and the strength of its natural defences.

Winchester was made the ecclesiastical capital of Wessex instead of Dorchester, and the lingering prestige attached to Wessex assisted it in being considered for many years as a quasi-metropolis.

Arithmetic.

BOYS ONLY.

1. Find the value of

$\frac{1}{16} \times £1\ 5s.\ 4d. + \frac{13}{21} \times £1\ 3s.\ 2\frac{1}{2}d. + \frac{17}{23} \times 14s.\ 10\frac{1}{2}d. =$

$11 \times \frac{£1\ 5s.\ 4d.}{19} + 13 \times \frac{£1\ 3s.\ 2\frac{1}{2}d.}{21} + 17 \times \frac{14s.\ 10\frac{1}{2}d.}{23} =$

$11 \times 1s.\ 4d. + 13 \times 1s.\ 1\frac{1}{2}d. + 17 \times 7\frac{1}{2}d. =$

$14s.\ 8d. + 14s.\ 4\frac{1}{2}d. + 10s.\ 11\frac{1}{2}d. =$

Ans. £2.

2. At end of first game he has $(1 - \frac{1}{10}) = \frac{9}{10}$

" second " " $(1 - \frac{9}{10}) \times \frac{1}{10} = \frac{1}{10} \times \frac{1}{10} = \frac{1}{100}$

" third " won $\frac{1}{2} \times \frac{1}{100} = \frac{1}{200}$

" " " had $\frac{9}{100} + \frac{1}{200} = \frac{19}{200} = \frac{1}{8}$

But $\frac{1}{8} = 4$ (by hypothesis)

∴ the whole = 32 Ans.

3. Multiply 28·75 by 32·8, and divide the result by $8\cdot\dot{4}9\dot{5} =$

$28\cdot75 \times 32\cdot8 \div 8\frac{493}{999} = 943 \div \frac{8443}{999} = \frac{943}{1} \times \frac{111}{8443} = 111$ Ans.

4.—

(*a*) $\frac{5}{8} = \frac{5}{2^3} = \cdot625$ (three places because of 2^3 in denominator)

(*b*) $\frac{93}{125} = \frac{93}{5^3} = \cdot744$ (three places because of 5^3 in denominator)

(*c*) $\frac{21}{48} = \frac{7}{16} = \frac{7}{2^4} = \cdot4375$ (four places because of 2^4 in denominator)

(*d*) $\frac{77}{88} = \frac{7}{8} = \frac{7}{2^3} = \cdot875$ (three places because of 2^3 in denominator)

(*e*) $\frac{72}{88} = \frac{9}{11} = \cdot\dot{8}\dot{1}$ (non-terminating)

GIRLS ONLY.

1. If 105 persons save on an average 19s. 10½d. each in a year, what will their whole savings amount to in 17 years 219 days? = $17\frac{3}{5}$ years.

19s. 10½d. × 105 × $17\frac{3}{5}$ = £104 6s. 10½d. × $17\frac{3}{5}$ = £1836 9s. Ans.

2. Make out the following bill :—

Castleton, 13th July, 1891.

Mr. Robert Williams.

Bought of William Roberts, Fruiterer, etc.

		£	s.	d.
1st July	27 bushels of plums @ 10¾d. a gall.	9	13	6
5th "	960 peaches @ 5 per shilling ...	9	12	0
9th "	1¾ cwts. of apples @ 2½d. per lb.	2	0	10
13th "	5 casks of cider, each 36 galls., @ 1½d. per pint	7	10	0
	Total	28	16	4

3. What must be added to $1\frac{9}{7} - 3\frac{1}{4} + 1\frac{3}{8}$, to make $\frac{11}{12} - \frac{33}{44} + \frac{14}{11}$.

$(\frac{11}{12} - \frac{33}{44} + \frac{3}{8}) - \frac{19}{7} - \frac{13}{4} + \frac{9}{8} =$

$\frac{22 - 23 + 16}{24} - \frac{260 - 455 + 252}{140} =$

$\frac{15}{24} - \frac{57}{140} =$

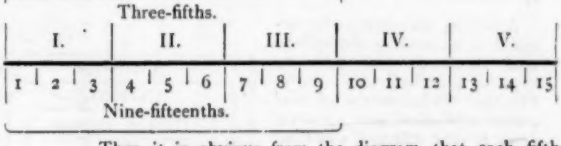
$\frac{5}{8} - \frac{57}{140} =$

$\frac{175 - 114}{280} =$

$\frac{61}{280}$ Ans.

4.—

(*a*) Show by means of a diagram that the value of a fraction is not altered by multiplying the numerator and the denominator by the same quantity, *e.g.*, $\frac{3}{5} = \frac{9}{15}$. Draw a line and divide it into five parts, then three of them will be $\frac{3}{5}$.



Then it is obvious from the diagram that each fifth contains three fifteenths, and therefore that three-fifths contains nine fifteenths.

(*b*) Reduce $\frac{61101}{74679}$ to its lowest terms.

G.C.M. = 6789. $\frac{61101}{74679} = \frac{61101 \div 6789}{74679 \div 6789} =$

Ans. $\frac{9}{11}$

THE 1891 CERTIFICATE EXAMINATION.

BY DR. GEORGE BEACH, M.A.,

Co-Author of 'Our Mother Tongue,' 'Arithmetic for Girls,' Author of 'Elements of English,' 'Entertaining Readers,' etc.

Logic (*Continued*).

17. A *hypothetic proposition* is a compound proposition whose parts are connected by *if*, or some corresponding word. In a hypothetic there are always two parts, of which the one that contains the condition is called the *antecedent*, and the part which is inferred is called the *consequent*.

To the truth of a hypothetic it is only needful that the latter part should follow from the former, *e.g.*,

'*If stones are men, then stones think*' is a perfectly true proposition, although each of its component propositions is false.

18. A *disjunctive proposition* is a compound proposition, one in which the whole subject is contained in more than one predicate. Its truth depends upon all the predicates conjointly, including the entire extension of the subject. Thus: '*A l time is either past, present, or future*' is true.

19. Some apparently *simple* propositions are *in reality compound*, as—

(*a*) '*Only one man survived.*' This contains *two* assertions, viz., '*One man survived*' and '*No one else survived.*'

(*b*) '*All but he had fled.*' This contains *two* assertions, viz., '*He had not fled*' and '*All others had fled.*'

(*c*) '*When Joseph died the Egyptians commenced their oppression.*' This contains *two* assertions, viz., '*The Egyptians did not oppress during Joseph's life-time*' and '*After his death they did oppress.*'

20. A *definition* is a proposition which explains what a name or a thing is. It should specify the least general class to which the thing belongs, together with the thing's peculiar, distinguishing and essential attributes. '*A boy is a male child*' is a perfect definition, because *child* denotes the *last* general class to which *boy* belongs, and *male* is the boy's essential attribute. Such definitions as '*A boy is a male human being,*' '*A boy is a male animal,*' '*A boy is a rational child*' would all be defective, as they violate one of the two requisites of a perfect definition. A definition should not contain the term defined, *e.g.*, *An Adverb is a word that modifies a Verb, an Adjective, or another Adverb.*

21. *Description* differs from definition in being loose and inexact, and neglecting to explain by essential attributes, etc. It is not to be employed in logic.

Syllogisms.

22. A *Syllogism* is the inference of one proposition from two.

From Syllogisms and all other methods of Deductive Reasoning no new truths can be discovered, but yet the full value of the truths already stated are by them fully extracted and made known to the mind. Deductive reasoning is analytical; Inductive reasoning is synthetical.

Aristotle, who cannot be accused of underating the syllogism, seems to state both its capacity and limit very clearly. He says: '*Whatsoever is affirmed universally about any universal term is also affirmed about all things which are contained under that universal term; and whatever is denied universally about any universal term, is also denied about all things which are contained under that universal term.*' Thus, whatever can be affirmed or denied about everything, or every animal, or every human being, or every child, can be affirmed or denied about every boy.

We have thus three propositions, two of which are given and are called the *Premisses*, and one of which is inferred and is called the Conclusion.

(1) Every man is loved by him.
(2) I am a man. } Premisses.
(3) I am loved by him. Conclusion.

23. As every proposition has two terms, the Subject and Predicate, so every syllogism must have six terms. But only three of these are different, each one being repeated twice. The terms in the example given above are *Things loved by him, man, me.*

The word *man* is called the *middle term*, as by means of it the first and third terms were brought into connection.

The infallible rule for finding the middle term is: *The term omitted from the conclusion is the middle one.*

24. The *major term* is (as will be seen from the illustrative square) the largest term, and is *the predicate of the conclusion.* Thus '*loved by him*' is the *major term.* Of the two premises, that which contains the major term is called the *major premiss*, and that which contains the minor term is called the *minor premiss.*

25. The *minor term* is the *least* term, and is *the subject of the conclusion.* Thus '*I*' is the minor term in the given instance.

26. A *Sorites* is a compound syllogism consisting of several propositions so disposed that the predicate of each preceding is the subject of each subsequent (the conclusion of each simple syllogism being deferred), until the last predicate is thence predicated of the first subject, *e.g.*,

Every boy is a child.
Every child is a human being.
Every human being is an animal.
Every animal has life.
Therefore Every boy has life.

This *Sorites* may be resolved into the following syllogisms:—

I. Every child is a human being.
Every boy is a child.
Therefore Every boy is a human being.

II. Every human being is an animal.
Every boy is a human being.
Therefore Every boy is an animal.

III. Every animal has life.
Every boy is an animal.
Therefore Every boy has life. Q. E. D.

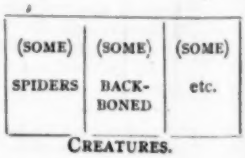
27. The most important rule of the ordinary syllogism is that '*The middle term must be distributed, that is, taken universally, or in its whole extent of meaning, once at least in the premisses.*'

Thus the syllogism:—

Some creatures have backbones
Spiders are some creatures
Therefore Spiders have backbones:

is faulty, because of the *undistributed* middle term, some creatures.

This defect is to be traced (see diagram) to the fact that there may be four terms in this faulty syllogism, because the term '*some creatures*' in the Major Premiss, may not be the same '*some creatures*' as in the Minor Premiss.



28. The four chief fallacies in reasoning are—

(*a*) '*Petitio principii*' or '*begging the question*' consists in taking without proof as a premiss or premisses, which virtually involve the conclusion, *e.g.*,

The point to which all heavy bodies tend is the centre of the universe,

The point to which all heavy bodies tend is the centre of the earth.

∴ The centre of the earth is the centre of the universe.

The fallacy is rather a material than rational one.

(*b*) *Arguing in a circle* is a species of *petitio principii*. It consists in using the conclusion to prove the disputed premiss, from which again the conclusion is inferred. Take the subjoined examples:—

I. The Church is infallible.
The Church declares the Bible divinely inspired.
∴ The Bible is divinely inspired.

II. The Bible is divinely inspired.
The Bible declares the Church infallible.
∴ The Church is infallible.

(*c*) *Reasoning from particular to general.*

Jean, Denis, and Napoleon are brave.
" " " " are Frenchmen.
Therefore Frenchmen (as a rule) are brave.

The fault consists in taking too few instances.

(*d*) *Ignorationis elenchi* or of *false refutation* is when something is proved which does not refute the adversary, but is assumed so to do.

Algebra.

1. To expand $(x - y)$ 7.

First step

(the indices) $x^7 \quad x^6y \quad x^5y^2 \quad x^4y^3 \quad x^3y^4 \quad x^2y^5 \quad xy^6 \quad y^7$.

Second step (the coefficients)

	x^7 (1)	$7x^6y$ (2)	$21x^5y^2$ (3)	$35x^4y^3$ (4)	$35x^3y^4$ (5)	$21x^2y^5$ (6)	$7xy^6$ (7)	y^7. (8)
(1) Coefficient is Unity						$= 1$		
(2) " " $\frac{7}{1}$	of Last Coeff.				$= \frac{7}{1} \times 1 =$		7	
(3) " " $\frac{21}{3}$	" " "				$= \frac{21}{3} \times 7 =$		21	
(4) " " $\frac{35}{4}$	" " "				$= \frac{35}{4} \times 21 =$		35	
(5) " " $\frac{35}{5}$	" " "				$= \frac{35}{5} \times 35 =$		35	
(6) " " $\frac{21}{6}$	" " "				$= \frac{21}{6} \times 35 =$		21	
(7) " " $\frac{7}{7}$	" " "				$= \frac{7}{7} \times 21 =$		7	
(8) " " $\frac{1}{8}$	" " "				$= \frac{1}{8} \times 7 =$		1	

Third Step (the signs).—These run *plus* and *minus* alternately.

$$x^7 - 7x^6y + 21x^5y^2 - 35x^4y^3 + 35x^3y^4 - 21x^2y^5 + 7xy^6 - y^7$$

2. In the expansion of $(x + y)^n$ the coefficients of terms equidistant from the ends are equal.

This is very simply proved by expanding $(x + y)^n$ and $(y + x)^n$.

3. To find the coefficient of the 100th term of $(x - 2y)^{103}$.

Here there are 104 terms, and the 100th term will be the fifth from the end. Therefore we will deal with the fifth from the beginning. Let $2y = z$.

$(x - z)^{103} = x^{103} - 103x^{102}z + 5253x^{101}z^2 - 176851x^{100}z^3 + 4421275x^{99}z^4$, etc.

∴ the 100th term from end of $(x - z)^{103} = -4421275x^4z^{99}$
$= -4421275 = \underline{x^4(2y)^{99}}$ Ans.

4. In how many years will a sum of money double itself at 4 per cent. compound interest?

Here if P = Principal, r = rate of interest, and n = No. of years, the statement is—

$$P(1 + r)^n = 2P$$
$$(1 + r)^n = 2$$
$$(1{\cdot}04)^n = 2$$
$$\text{Log. } 1{\cdot}04 \times n = \text{Log. } 2$$
$$n = \frac{\text{Log. } 2}{\text{Log. } 1{\cdot}04} = \frac{{\cdot}3010300}{{\cdot}0170333} = 17{\cdot}6 \text{ years.}$$

5. In how many years will a sum of money treble itself at 5 per cent. compound interest?

We may now state right away from the experience of the foregoing problem.

$$n = \frac{\text{Log. } 3}{\text{Log. } 1{\cdot}05} = \frac{{\cdot}4771213}{{\cdot}0211893} = 22{\cdot}5 \text{ years.}$$

6.—Show that the coefficient of the middle term of $(a + x)^{4n} \equiv 2^{2n} \frac{1 \times 3 \times 5 \ldots\ldots (4n - 1)}{1 \times 2 \times 3 \ldots\ldots 2n}$

Now there are $(4n + 1)$ terms, therefore the middle term is the $(2n + 1)$th.

∴ Coefficient of $(2n + 1)$th term $\equiv \frac{4n}{1} \times \frac{4n - 1}{2} \times \frac{4n - 2}{3} \ldots\ldots \frac{2n + 1}{2n}$.

Equating and cancelling out denominators we get—

$$4n(4n - 1)(4n - 2).....(2n + 2)(2n + 1) \equiv 2^{2n} \times 1 \times 3 \times 5 .....(4n - 3)(4n - 1)$$
$$4n(4n - 2)(4n - 4).....(2n + 2).....(4n - 1)(4n - 3).....(2n + 1) \equiv 2^{2n} \times 1 \times 3 \times 5 (2n - 1)(2n + 1)(2n + 3).....(4n - 3)(4n - 1).$$
$$4n(4n - 2)(4n - 4).....(2n + 4)(2n + 2) \equiv 2^{2n} \times 1 \times 3 \times 5 .....(2n - 3)(2n - 1)$$
$$2^n 2(2n - 1)(2n - 2).....(n + 2)(n + 1) \equiv \quad " \quad " \quad "$$
$$2n(2n - 1)(2n - 2)(n + 1) \equiv 2^n \times 1 \times 3 \times 5 .....(2n - 3)(2n - 1)$$
$$\frac{\lfloor 2n}{\lfloor n} \equiv \frac{2^n \lfloor 2n}{2n(2n - 2)(2n - 4).....2}$$
$$\equiv \frac{2^n \lfloor 2n}{2^n n(n - 1)(n - 2).....1}$$
$$\equiv \frac{2^n \lfloor 2n}{\lfloor n} \equiv \frac{\lfloor 2n}{\lfloor n \rfloor n}$$

Q. E. D.

THE EXAMINATION ITSELF.

We have so recently given store of good advice both to the 1891 Scholarship Candidates and the October-examined pupil teachers, that we would refer our readers to those maxims then delivered.

But a few points are absolutely necessary to be re-reiterated.

(1) Keep in good bodily health by taking regular meals, enough sleep, and sufficient exercise.

(2) Keep in acute mental vigour by consistent study, not too many hours a day, and by cheerful diversions.

(3) Acting teachers should lodge near the examination room.

(4) Don't omit to fill up the name-columns on every paper.

(5) Let the work on the scrap side of the manuscript book be neat and decipherable.

(6) Don't omit to revise, even if less matter be put down.

(7) Be in the examination room punctually, and leave it as late as possible.

(8) Work with your watch in front of you.

(9) Don't trouble to compare results with your fellow candidates during the intervals.

(10) Don't connive at any breach of rules, however apparently trivial.

Finally, we most heartily and sincerely wish to all our readers who have industriously and systematically studied, 'A Merry Xmas' and 'A Happy New Year,' heightened by the consciousness that something attempted, something done, has earned deserved repose.

CORRESPONDENCE.

We shall be pleased to reply briefly and through these columns to any one seeking examinational information and advice.

This privilege does not, of course, extend to furnishing the solutions and answers for problems.

Replies demanding urgency will be promptly forwarded per post on receipt of stamped and addressed envelope. A post will be saved by writing direct to DR. GEORGE BEACH, M.A. *(Examination Editor of Practical Teacher)*, STANLEY MOUNT, MACCLESFIELD.

M. D. G. (Demerara).—(1.) W. Collins and Co., Glasgow, Advanced Science Series, 2s. 6d. (2.) We cannot discover; Deighton's is now the best.

J. J. (Launceston).—All Pupil Teachers who failed at the last Scholarship Examination will be permitted to try again.

MAC. (Newcastle-on-Tyne).—It is not *safe* to omit it, especially for Acting Teachers. In *former* years it was not required from those First-Years proceeding to a second year's residence.

N. P. (Coventry).—You cannot sit both in May and December.

L. Sw. (Bilston).—We are much obliged for your appreciation, and have utilised your kind information.

S. S. S. (Blackpool).—The 'Multum in Parvo' Atlas, published by W. and A. K. Johnston, price 2s. 6d.

J. U. (York).—Brook's Geography is now on sale; 634 pp. cr. 8vo, for 3s. 6d.!

J. J. (Billinghurst).—(1.) Not unless you take the Geometry by passing in the *whole* of Science, Subject I. (2.) The Civil Service Style. Try Hughes' *P.T.* Copybook. (3.) La Jeune Sibérienne. Yes. (4.) The manual is good enough.

ROYAL UNIVERSITY (Dublin.)—Curtis' Latin, Abbott's Latin Prose through English Idioms, Arnold's Latin Prose Comp., Part I.

W. K. B. (Birmingham.)—We neither answer questions concerning controversial politics, nor do we decide bets. Try Reynolds' Miscellany.

H. B. (Sunderland.)—You appear to be thoroughly well qualified for a County Council Lecturership. See remarks in 'Schoolmaster' of 14th ult.

ONLY J. (Belfast).—A Gerund, not a Participle.

A. BETA (Bury).—There should be no difficulty in obtaining the books from any Scholastic Stationer.

WEST MUIR (Kendal).—She is still qualified.

C. B. D. (Renfrew).—(1) Tenth on the list. (2) For remaining replies, kindly forward stamp.

DIER.—Unavoidably held over.

F. J. H. (Acton W.)—(1) Not divulged, but very similar to *P.T.* marks. Dom. Ec., Science, Drawing, French, probably fifty each. (2) Yes, in some colleges, but not all; but there is an outcry against the practice. (3) Eighty-five per cent., but another five could easily be obtained by making the letters rounder.

PAX (Chester).—See this month's issue.

F. W. D. (Scarboro').—Yes.

E. A. P. (Trevecca).—Would do with improvement. Eighty-five per cent. of marks.

N. P. (Hull).—You may try any number of times.

J. L. (Dawley).—*-ize* when a word comes direct from the Greek. *-ise* when it comes through the French.

ANSWERED PER ORDINARY LETTER.

W. P. (Maidstone), J. N. (Tranmere), LIZ (Dundee), H. S. C. (Caversham), P. P. (Longton), NOSCO (Langley), P. S. P. (Fraserburgh), R. O. (Hastings), D. G. (Dudley), E.C. (St. Keyne), MURT (Clonmel), Z. S. (Darwen), J. D. (Ludlow), W. A. (Peterborough), 'Y.' (Leeds), J. F. (East Grinstead), Q. D. (Douglas), M. B. (Morpeth), C. D. (Frome), E. T. (Builth), N. F. F. (Willenhall), G. L. W. (Great Rissington), JOHNNY (Bolton), 'J.' (Longton), F. W. (Hoyland Nether), SOUS (New Holland), K. I. N. (West Bromwich), J. I. (Braunston), TANK (Lancaster), O. A. P. (Leicester), E. L. T. (Clayton), SOZO (Market-Rasen), A. M. P. (Barrowby), H. D. T. (Wellingsborough), J. W. (Penygraig), C. P. (Congleton), F. W. D. (Longdon), E. B. (Preston), J. C. (Alfreston), REG. CONTR (Mytholmroyd), EN AVANT, L'ESPERANCE, PATTIE, PAR EXCELLENCE, LA MARGUERITE (Stevenage), L. H. T. (Tavistock).

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PUBLICATIONS REVIEWED.—PRIZE BOOKS.

MESSRS. BLACKIE AND SON'S LIST.

AMONGST the prize books this year, which are, if possible, better than ever, we hail with delight new and cheaper editions of three old favourites.

First and foremost is :—

Perseverance Island. By Douglas Frazer.

A book really more romantic than 'Robinson Crusoe' itself, and every incident so accurately described that we are ready to follow the ever-varying fortunes of the castaway. The author's invention and resource are worthy of Jules Verne, and he has produced a volume which should be on every lad's book-shelf.

2nd.—**The Wigwam and The War Path.** By Ascot R. Hope.

Indian warfare has and always will have a special charm for boys. This book is so well written, and the incidents so thrilling, that lads are never tired of it. Whenever the boys are at home for the holidays 'The Wigwam and the War Path' is sure to be found lying about face downwards to mark the place where somebody has been reading. What better recommendation could a book have?

3rd.—**The Rover's Secret.** By Harry Collingwood.

In sea stories this talented author excels, and this is one of his best. It is full of wonderful adventure, and hair-breadth escapes, told in a style which holds the reader spell-bound. The book will be eagerly welcomed by those who have read it before, and for those who have not there is indeed a treat in store.

Nell, Edie, and Toby; Their Strange Adventures. By Geraldine Mockler.

This is a pretty bright story for little folks. They will be sure to enjoy all the pranks of the lively trio of children.

Kitty Carroll. By L. E. Tiddeman; and

A Joke for a Picnic. By W. L. Rooper.

Both of these are beautiful little prize books containing well written children's stories.

Sharp Tommy: A Story of Circus Life. By Elizabeth J. Lysaght.

Tommy thinks himself far too sharp for the humdrum life of a barber's shop. He leaves a good home to follow a circus troupe, but soon finds to his cost that it is possible to be too sharp, and after his circus experiences is glad to settle down to steady work.

A Parliament of Pickles. By Cora Langton.

This little book contains the story of children who make up a mock parliament, form themselves into an imaginary army, and get endless fun out of their historical knowledge. It is a bright healthy story for children of ten or twelve.

Wild Meg and Wee Dickie. By Mary W. Ropes.

A good pure story, showing how love for a little helpless child will soften and refine the wildest natures. Meg conceives a violent liking for a poor little cripple, and when she leaves her cross old guardian takes the helpless little one with her. Through all her troubles and poverty Dickie is the one tender spot in her heart. This little bit of love gradually softens her whole nature, and she becomes no longer 'Wild Meg,' but a loving, brave girl, a nurse in the children's hospital. A story full of pathos and smypathy.

Bab; or, the Triumph of Unselfishness. By Ismay Thorn.

Bab is the personification of unselfishness. She goes on a visit to her cousin Gladys, who is a spoilt selfish girl. For some time there is much unhappiness between them. After a while, however, Bab's gentle loving ways win, and Gladys sees her conduct in the true light.

Grannie. By Elizabeth J. Lysaght.

A pretty story well-written and most suitable for Christmas reading. The loving teaching of Grannie will abide in many a young heart.

Marian; or, The Abbey Grange. By A. E. Armstrong.

How sorrow and trouble often bring out all the best qualities in a girl is told in the life story of Marian. Left in the hands of a miserly father, the brother and sisters have a miserable time enough. Upon the father's death everything comes into the hands of a cousin, as miserable and miserly as the father had been, and things are worse than ever. Marian is the spirit of cheerfulness amongst it all, and bravely the young folks face their difficulties. At last the cousin repents of his conduct, makes a will in favour of Marian and her brother, and betakes himself to the South of France to die. All ends happily, and Marian is rewarded for her patience.

Gladys Anstruther; or, The Young Stepmother. By Louisa Thompson.

This pathetic story reveals the misery and unhappiness which can be wrought by even a little child of jealous and unkind disposition. The home life of children is shown to have very much to do in forming their character. The tale is clever and even dramatic; but surely few young wives, who had any love for their husband, could pursue such a course of folly and blindness as this mother does with her stepchild. Naughty children should learn a lesson from this book. The glimpse of children being trained for the stage is very interesting.

Brave and True, and other Stories. By Gregson Gow.

The pretty story of Emmy, a little girl who was brave and true, is told by a mother to her children. It turns out to be her own life's history, and all the strange things really happened to herself. There are three other tales in the book, all of them excellent and suitable for children of ten or twelve years of age. The type is exceptionally large and clear. There are also several pretty pictures in the book.

Climbing The Hill, and other Stories. By Annie S. Swan.

This little volume contains three bright, sensible tales for young folk. 'Climbing the Hill' is a story of self-reliance and industry, the perusal of which would do any boy or girl good. The book is well bound, and is sent forth in a pretty and serviceable cover.

Stimson's Reef. By C. J. Hine.

The lads in this story lose their father and also find that they are left poor. The father's money had all been sunk in a gold mine called Stimson's Reef. Joining two other kindred sprits they take a small vessel of their own and set out to find the unlucky mine. The adventures and exciting scenes they pass through make up a thrilling story.

Littlebourne Lock. By F. Bayford Harrison.

Littlebourne is the name of a small village where the chief events in the story take place. The lock keeper's wife, a kindly soul, brings a poor niece to her home from a dingy crowded London lodging. The girl's hard sunless life has hardened her heart and left very little that is lovable in her character. The misery of some of our poor in large towns is touchingly pourtrayed, and will awaken thoughts of sympathy. How Edward Rowles, the lock keeper, will persist that all his brother-in-law's trouble comes through working at night instead of day, is very droll indeed. He says 'Night was made for sleep, and day for work.' Nevertheless he does not object to read the morning paper, which of necessity is printed in the night. A very instructive little volume in an elegant binding.

Three Bright Girls. By Annie E. Armstrong.

The three girls are sisters, who by sudden misfortune lose their father and nearly all their wealth. The mother is prostrated by the blow, and the three girls have to take the management of affairs into their own hands. They have brave hearts and cheerful spirits and meet with a good many kind friends. They find that to live without wealth is less difficult than they at first imagined. The book will be a capital gift for a young girl; it is exqusitely illustrated by W. Parkinson and handsomely bound.

Silas Verney. By Edgar Pickering.

An old world story of the time of the Restoration. In those days highwaymen were often men from good families who took to the road for a living. The effects of historical events on family life are clearly pictured in the history of Silas Verney. How he was defrauded for some years out of estate and home, and banished from his country, make a thrilling story. His curious experience with the old Dutchman, and the retribution which overtook his false cousin, are cleverly worked out. The old time atmosphere about the story is refreshing in the extreme and highly entertaining.

The Lonely Pyramid. By J. H. Yoxall.

A wonderfully clever story. Major Lefevre with his young son and attendant are crossing the desert, intent on finding out, if possible, the cause of the mirage. The major loses his track and falls into the hands of the fanatical Mahdi. The lad and negro attendant keep on their way till they arrive at the lonely pyramid. In a day or two the Mahda and his followers also arrive there, and the only refuge for the major and his friends is in the interior of the Pyramid, which they explore. The wonderful sights and weird spectacles therein are graphically pourtrayed. The book is full of information, and yet so simple that it is within a child's grasp.

Brownsmith's Boy: A Romance in a Garden. By G. Manville Fenn.

The name of G. Manville Fenn attached to a story for young people is in itself a guarantee of excellence. The one now before us satisfies our best expectations. The characters are life-like, and even the very dogs act up to their character. Poor half-witted Shock, and honest simple Ike the labourer, will awaken the best kind of sympathy, whilst Brownsmith himself is a model for anybody to copy. The outside of the book is a pretty preface to a delightful story.

Girl Neighbours. By Sarah Tytler.

We are glad to welcome this new and cheaper edition of a good, sensible story for girls. Pie Stubbs and Harriet Cotton are everyday girls such as we all meet with. The one, 'Pie,' is a homely little housewife, the other the spoilt child of a wealthy man. It does not at first seem that they can have much in common, but the story shows how each learns a good deal from the other, and how valuable their mutual friendship becomes. Just the kind of story to help our girls to become good sisters and live lives of usefulness.

The Pilots of Pomona: A Story of the Orkney Islands. By Robert Leighton.

Few of this season's prize books have given us so much pleasure in reading as this one. The life of the fisher folk on the Orkneys is picturesque and fresh. The capturing of smugglers, and the perils experienced by Halcro Ericson at sea, give piquancy to a charming story of home life. There is a map showing the exact position of Pomona, and the various expeditions of Halcro can easily be traced thereon. The story is cleverly worked out and takes a place amongst the best books for young people. The illustrations by John Leighton are exquisite.

The Dash for Khartoum: A Tale of the Nile Expedition. By G. A. Henty.

This capital story will have especial interest for our young people, as the historical facts are within their own recollection. Where is the boy or girl who does not remember the news of Gordon's death? The remarkable life story of the two boys who joined in the expedition is a special feature in the book.

The narrative shows how a little quiet talk with a lad's best friends would often save himself and those who love him a world of trouble. A lad should think twice before taking his affairs into his own hands. Handsomely bound and illustrated, this book is a valuable present for a youth.

Redskin and Cowboy: A Tale of the Western Plains. By G. A. Henty.

This true story of a cowboy's life is given in Mr. Henty's best style. In reading through the book we have seemed to become personally acquainted with the various characters. The keeper of the gambling-table, cunning, callous, and cowardly, and the quaint, self-contained Limping Frank 'doctor' are drawn with a masterly hand. Every page is full of interest, and will be thoroughly enjoyed by adult readers as well as younger folks. After reading this narrative no lad could imagine life out West to be all fun and idleness. Several of the scenes are intensely dramatic. Truly says the author in his preface 'Truth is stranger than fiction.' The twelve splendid pictures by Alfred Pearse add considerably to the value of the volume, which is a perfect prize book.

Held Fast for England. By G. A. Henty.

The gallant and successful defence of Gibraltar, from the combined attacks of France and Spain, forms the main feature of this capital story. Bob Repton, the boy hero, is first introduced to us at school. Bold, truthful, but full of mischief, he is everlastingly getting into some scrape or other. He generally manages, however, to come out on the right side, by being straightforward, and not shirking well-deserved punishment. The night escapade, and the struggle with burglars, will just delight our lads. In our navy, he is the right boy in the right place. He proves to be worthy of trust, and is sent on several most hazardous expeditions. A thorough English soldier and a gentleman, his life is crowned with honours and happiness. The historical events in the story will be followed with breathless interest. The lads who read this book will learn that our stronghold at Gibraltar has cost our countrymen not a little suffering and hard fighting. The pictures by Gordon Browne are excellent, and lucky will be the lad who gets this volume for his prize.

MESSRS. S. W. PARTRIDGE AND CO.'S LIST.

Frank Burleigh. By Lydia Phillips.

Frank, the hero of the story, is suddenly deprived of his father and also of his fortune. Nothing daunted, he determines to succeed in life, and work hard at anything he can get to do. He is fortunate in his friend, who speaks a word for him, and secures him work as an office boy. Despite much that is hard to bear, he plods on, and finally reaches the head place in the firm. Fortune again smiles on him. A rich uncle turns up from Australia, and reinstates Frank with his mother and sister in the old home. Through fortune and misfortune alike Frank bears himself nobly, and being faithful in little is also faithful in much.

Animals and Their Young. By Harland Coultas.

Here we have a beautiful natural history picture book. The twenty-four full-page illustrations by Harrison Weir are alone worth the price of the volume. Explanatory letterpress accompanies each picture. Instructive and entertaining, the whole is presented in a handsome cover, suitable for a Christmas present.

The Little Bugler: A Tale of the American Civil War. By G. M. Royce.

This thrilling story of war, with all its attendant excitement and horrors, will be as interesting to adults as to children. The story is true, therefore we can enter into it with all our heart, and partly realise what those felt and suffered during the terrible war. That this little book will be a favourite with both boys and girls there can be no shadow of doubt.

Grey Cliffe Abbey. By Jennie Perrett; and **Jessie Dyson.** By John A. Walker.

Attractive looking little books, containing pure, good, and entertaining stories for children.

The Way to Succeed. By W. M. Thayer.

This is not a story book, but a series of short incidents from the lives of great and good men; also short essays on the various noble traits that are found in their characters. Advice is given to young men and women on how to act and what to read, so as to influence their own lives for good. The book is bright and entertaining, and young people will thoroughly enjoy reading it. Having also an elegant binding it will be a most acceptable present.

Mrs. Lupton's Lodgings. By Laura M. Lane.

This is a suitable book for elder scholars or pupil teachers. The story tells much about the life of some of the students in the British Museum. How they have often to work and almost starve before they can succeed will be a revelation to young people who think success must attend the efforts of a so-called genius. Mrs. Lupton is a kindly soul, who takes an interest in her student lodgers, and often manages to give them a help in time of need. We heartily commend this volume.

Like a Little Candle. By Margaret S. Haycroft.

Bertie, an artist's little daughter cast adrift on the tide of life, is a through Christian, and wherever she finds her home her faith shines as a candle. Her bright, cheerful spirit is a comfort to herself, and sheds sunshine around her.

Her Two Sons: A Story for Young Men and Maidens. By Mrs. Chas. Garnett.

The struggle between right and wrong is touchingly pourtrayed in 'Her Two Sons.' How often gambling is a fatal pitfall to a young man starting life! In this book love and kindness bring the erring one back to the paths of virtue. A useful present for a youth.

Harold; or, Two Died for Me. By Laura A. Barter.

Harold is a temperance boy, and tries his best to win followers for the cause he is so much attached to. He lives what he professes, and in the end is the means of saving his uncle, body and soul.

Who was the Culprit? By Jennie Chappell.

This narrative tells how Rob Holme was painting a picture for a prize competition, and how in a mysterious manner it was twice spoiled. Circumstances all seem to point to his foster brother as the culprit, and although he stoutly denies doing the mischief, everybody treats him as though he were guilty, thus making his life miserable. One night, however, Rob himself is found walking in his sleep, and so the mystery is all explained. The story teaches how careful we should be in accusing anyone of wrong doing.

John Oriel's Start in Life. By Mary Howitt.

How John leaves his poor home and goes on tramp looking for work is a pathetic story of every-day life in poor districts. Truth and honesty help John over his difficulties, and success attends him. The story proves that after all 'honesty is the best policy.'

Bel's Baby. By Mary W. Ropes.

Bel's love for the baby waif is a sweet little story. It shows that rags and dirt often cover a warm heart and generous spirit. Children must be better for reading these tales, full of love and sympathy for the helpless.

Michael Faraday, Man of Science. By Walter Jerrold.

Biographies of men such as Faraday are amongst the best and most ennobling kind of literature we can put into the hands of boys and girls. Steady plodding work and Christian virtues combined to make Faraday a bright example to his race.

The Slave and his Champions. By Charles D. Michael.

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STANDARD VI

Card 25.

1. Find the value of ·428571 of half a guinea × $9\frac{1}{7}$.
2. If $1\frac{1}{2}$ tons cost £1 17s. 4d., how much will $\frac{3}{8}$ of $\frac{8}{19}$ of $1\frac{1}{4}$ cwt. cost.
3. A gentleman left his fortune to be divided amongst his son and two daughters. The son received $\frac{4}{9}$, and one daughter received $\frac{1}{7}$; the other received £1,140. What was the amount of the fortune?
4. A boy wrote £10·6 instead of £10·6. What was the amount of his error?

Card 26.

1. In a school the sum of £23 6s. 8d. was raised. One third paid 1s. each, one third paid 1s. 6d., and the rest paid 1s. 8d. each. How many scholars were there?
2. Divide the difference between 90·66157 and 1·71432 by ·304135 to 4 places of decimals.
3. If $68\frac{1}{4}$ lbs. cost £1 12s. 8d., what ought $204\frac{3}{4}$ lbs. to cost?
4. A bank pays $3\frac{1}{4}$ per cent. interest, and I deposit £956 10s. How long must I keep it in to be able to draw out £1,189 12s. $11\frac{1}{4}$d.?

Card 27.

1. Simplify $\frac{6\cdot85 - 2\cdot5}{\cdot58} \times \frac{2}{3} \times \left(\frac{\frac{1}{4} - \frac{1}{5} + \frac{1}{6}}{\frac{1}{2} - \frac{1}{3}}\right) \times 54$.
2. From £1 7s. 6d. + $1\frac{1}{5}$ of 70s. + $\frac{3}{4}$ of 8d. take $\left(\frac{7}{80} + \frac{13}{1760}\right)$ of £1.
3. Divide 1556·24636 by 2·039.
4. A grocer buys sugar at $4\frac{1}{2}$d. per lb. and sells it at 48s. per cwt. What does he gain on a ton?

Card 28.

1. Simplify $\frac{4\frac{1}{2}}{8\frac{1}{4}} + \frac{9\frac{3}{4} - 1\frac{7}{8}}{5\frac{1}{4} + 2\frac{5}{8}}$.
2. The cost of $49\frac{1}{2}$ tons being £21 7s. 6d., what should be paid for 39 tons 12 cwts.?
3. A dealer had 240 yds. of cloth. He sold $\frac{3}{4}$ of it to one person, and ·5 of the remainder to another. How many yds. had he left?
4. Find the simple interest on £825 for 2 years 73 days at $2\frac{1}{2}$ per cent. per annum.

Card 29.

1. Find the difference between ·125 of 2 miles and ·175 of 2 furlongs.
2. What decimal of 3 miles is 33 yds.?
3. At 9 o'clock $\frac{4}{5}$ of the children in a school were present, and when 8 more had come it was found that $\frac{9}{10}$ were present. How many names were on the registers altogether?
4. If $\frac{2}{3}$ of a ship cost £1,000, what will $\frac{1}{6}$ cost?

Card 30.

1. A can do a piece of work in 16 days, B can do it in 20 days, and C can do it in 24 days. How long will it take them to do it working together?
2. Simplify $\frac{\frac{7}{10} \text{ of } \frac{13}{24} \text{ of } \frac{18}{21} \text{ of } \frac{17}{30}}{\frac{4}{5} \text{ of } \frac{1}{2} \text{ of } \frac{39}{56} \text{ of } \frac{56}{132} \text{ of } \frac{13}{16}}$ of $\frac{5}{17}$.
3. If 400 penholders cost £·75, what number can be bought for £$3\frac{3}{4}$?
4. Divide 38·164 by ·1316, and multiply the quotient by 13·868.

Card 31.

1. If 182 gallons were taken from a cask, and it was then $\frac{3}{7}$ full, how many gallons will it hold?
2. How long will £725 10s. be in amounting to £834 6s. 6d. at $2\frac{1}{2}$ per cent. per annum simple interest?
3. Reduce $2\frac{3}{10}$ of £3 12s. $9\frac{1}{4}$d. to the decimal of £36 8s. $1\frac{1}{2}$d.
4. Find the value of $9\frac{3}{8}$ of £1 + $13\frac{1}{3}$ of £5 8s. — $\frac{5}{11}$ of £4 10s.

Card 32.

1. If a man owes £2,880, and only pays 16s. $0\frac{3}{8}$d. in the £, what do his creditors lose?
2. 603·0376 ÷ ·1276.
3. Find the value of $1\frac{4}{7}$ of 1·425 of 3 hours + $1\frac{2}{5}$ of 135·5 minutes.
4. From an orange Mary receives $\frac{1}{3}$, Emily receives $\frac{1}{2}$ of Mary's share, and Lucy receives $\frac{1}{4}$ of Emily's share. How much is left?

Card 33.

1. What sum of money will produce £14 8s. as interest in 292 days at $3\frac{3}{4}$ per cent. per annum?
2. A man walking 32 miles a day completes his journey in 15 days. How long will it take him to complete it walking 30 miles a day.
3. Simplify $[(1\frac{9}{11} \text{ of } 1\frac{9}{13}) - (1\frac{7}{11} \text{ of } 1\frac{1}{13})] \div (2 \div 143)$.
4. Find the value of ·489 of $7\frac{1}{2}$ miles.

Card 34.

1. 100 lbs. of tea at 3s. 9d. per lb. were mixed with 84 lbs. of tea at 3s. 2d. per lb. If the whole was sold at 4s. per lb., what was the gain?
2. Find the value of $\left(\frac{4\frac{3}{8} - 1\frac{3}{4}}{3\frac{7}{9} \text{ of } \frac{1}{3}} \div 9\frac{1}{17}\right)$ of £1.
3. Out of my purse I spent ·458$\dot{3}$, and found I had £26 left. How much had I at first?
4. Take 18 in. from 4 ft., and reduce the remainder to the decimal of a yard.

Card 35.

1. If $\frac{3}{10}$ of an estate cost £3,000, what will half an estate half as large again cost at the same rate?
2. If 72 men earn £$24\frac{7}{10}$ in 6 days, what would 360 men earn in the same time?
3. How many times are $10\frac{4}{5}$ oz. contained in $11\frac{1}{16}\frac{3}{0}\frac{3}{0}$ lbs.?
4. What will £34 8s. 4d. amount to in 4 years at $2\frac{1}{2}$ per cent. per annum simple interest?

Card 36.

1. What would be the expense of covering a floor 48 ft. long and 30 ft. wide with matting at 2s. $5\frac{1}{4}$d. per sq. yd.?
2. 10·825 × 38·4 ÷ ·075.
3. 8 lbs. of sugar are worth 6 lbs. of rice, and rice is ·25 of a shilling per lb. How much will 4 lbs. of rice and 4 lbs. of sugar cost?
4. A grocer bought 4 tons 13 cwt. 2 qrs. of sugar for £87 5s. 4d., and paid £1 16s. 4d. carriage. How much must he charge per cwt. so as to clear £20?

Card 37.

1. If a bookseller allows $\frac{1}{10}$ for discount, how many 1s. 3d. books can be bought for £4 11s. $1\frac{1}{2}$d.?
2. At what rate per cent. will £125 8s. 4d. produce £2 10s. 2d. as interest in 146 days?
3. There are an equal number of boys and girls in a school. There are ·15 of the boys, and ·35 of the girls under 7 years of age. The number of children under seven is 40. How many children are there in the school?
4. Simplify $4\frac{2}{7} \times \left(\frac{9 - 4\frac{4}{5}}{7\frac{1}{3} \times 3\frac{3}{4}}\right) \div 24\frac{3}{11}$.

Card 38.

1. I borrow £$526\frac{1}{2}$ for 30 months at $7\frac{1}{2}$ per cent. How much must I lend in return for 27 months?
2. Add ·125 of £3; 1·125 of £2 10s.; and ·025 of £2, and reduce the sum to the decimal of £98 7s. 6d. to 4 places.
3. How long will 95 men take to do a piece of work if 76 men can do it in $62\frac{1}{2}$ days?
4. What decimal of a week is 12 hrs. 36 min.?

A Prize of HALF-A-GUINEA will be paid to the Teacher [illegible] **is th**

Card 39.

1. At what rate per cent. will £198 6s. 8d. produce £27 15s. 4d. as interest in 4 years?

2. Multiply ·2625 by ·0375, and divide the product by ·00375.

3. A boy starts on a journey and goes 25 miles a day. His father starts 4 days later and goes 30 miles a day. How long will it take the father to overtake his son?

4. Find the value of $3\frac{1}{3}$ of $\frac{10}{21}$ of 5 guineas + $\frac{15}{21}$ of 8s. 9d. + $\frac{5}{6}$ of 12s. 6d.

Card 40.

1. If 96 horses eat 100 tons of hay in a certain time, how much will 840 sheep eat in the same time, supposing 7 sheep eat as much as 2 horses?

2. I borrowed £350 for $2\frac{1}{2}$ years at $3\frac{1}{4}$ per cent. During the time I made use of it I got interest on it at $4\frac{1}{4}$ per cent. How much did I gain?

3. If 8·125 cwt. of tea cost £$62\frac{5}{8}$, what will 7·25 tons cost?

4. A boy's step measures $3\frac{5}{8}$ ft., and a girl's step measures $2\frac{7}{8}$ ft. If the boy takes 300 steps, how many steps will the girl take in going the same distance?

ANSWERS.

Card 1.

1. $12\frac{8}{9}$.
2. 7s. 4d.
3. £11 4s.
4. £19 12s.

Card 2.

1. 9s. $0\frac{1}{4}$d.
2. 4 years.
3. $48\frac{4}{9}$.
4. £2,730 10s.

Card 3.

1. £10 8s. 11d.
2. 1,324·05.
3. £6 1s. 9d.
4. £4 10s.

Card 4.

1. £845 15s. $1\frac{1}{2}$d.
2. ·045.
3. $3\frac{1}{15}$ miles.
4. 2 lbs.

Card 5.

1. £2,071 13s. 4d.
2. $28\frac{12}{144}$.
3. $20\frac{1}{2}$ acres.
4. 400 gals.

Card 6.

1. $76\frac{9}{10}$ yds.
2. 3s. $0\frac{1}{4}$d.
3. $3\frac{1}{2}$ per cent.
4. 143 lbs.

Card 7.

1. £1 5s. $2\frac{1}{4}$d.
2. $77\frac{203}{1331}$.
3. 20 days.
4. £380.

Card 8.

1. ·05.
2. 9d. in the £.
3. $2\frac{1}{2}$ years.
4. 1·1.

Card 9.

1. 9s. $2\frac{1}{2}$d.
2. 1,554·89.
3. 39 hrs.
4. $1\frac{133}{880}$.

Card 10.

1. £5,440.
2. £71 7s.
3. 236 yds.
4. $2\frac{1}{2}$ years.

Card 11.

1. $13\frac{1}{3}$.
2. ·6.
3. £2 12s. 2d.
4. 4 ft.

Card 12.

1. £6 19s. $8\frac{1}{4}$d.
2. £60 3s. 4d.
3. $\frac{64}{1331}$.
4. £53,000.

Card 13.

1. $48\frac{888}{1347}$.
2. £1 1s. 2d.
3. $4\frac{1}{3}$ mins.
4. £7,860.

Card 14.

1. $\frac{2041}{2800}$.
2. $2\frac{1}{2}$ per cent.
3. $288·86\frac{2}{3}$.
4. 5 guineas.

Card 15.

1. £106 6s. 3d.
2. ·75.
3. $\frac{128}{625}$.
4. £10 11s. 3d.

Card 16.

1. £219 10s.
2. ·68125.
3. $16\frac{4}{11}$ days.
4. 1.

Card 17.

1. 2s. 4d.
2. $12·2228\frac{2}{3}$.
3. $3\frac{1}{2}$ years.
4. 7 tons 8 cwt. 2 qrs.

Card 18.

1. $18\frac{133}{1331}$.
2. £75 3s. 4d.
3. £31,996 16s.
4. £62 10s.

Card 19.

1. 257 dresses.
2. $1\frac{2}{45}$.
3. 5s. 7d.; $\frac{144}{961}$.
4. $183\frac{8242}{10625}$.

Card 20.

1. £94 1s.
2. $\frac{1}{3}$.
3. 126·5 days.
4. £6,525.

Card 21.

1. $1\frac{2}{3}$ times.
2. 1st. £166 13s. 4d.; 2nd. £333 6s. 8d.; 3rd. £500.
3. $13·\dot{3}$.
4. $1\frac{1}{2}$ per cent.

Card 22.

1. 10 miles an hour.
2. 374 yds.
3. 49·34376.
4. $1\frac{133}{961}$.

Card 23.

1. £185 12s. 6d.
2. $9\frac{8}{19}$ days.
3. 83·02.
4. $\frac{3333}{41163}$.

Card 24.

1. £179.
2. $\frac{12}{17}$.
3. 15d. in the £.
4. 8 per cent.

Card 25.

1. £2 1s. $7\frac{1}{2}$d.
2. $3\frac{1}{3}$d.
3. £3,780.
4. 1s. 4d.

Card 26.

1. 336 scholars.
2. 292·4597.
3. £4 18s.
4. $7\frac{1}{2}$ years.

Card 27.

1. 195.
2. £5 7s. 6d.
3. 763·24.
4. £6.

Card 28.

1. $1\frac{3}{11}$.
2. £17 2s.
3. 30 yds.
4. £45 7s. 6d.

Card 29.

1. 1 fur. 26 po.
2. ·00625.
3. 90 names.
4. £1,666 13s. 4d.

Card 30.

1. $6\frac{13}{17}$ days.
2. $\frac{11}{17}$.
3. 2,000 penholders.
4. 4021·72.

Card 31.

1. $318\frac{1}{2}$ gals.
2. 6 years.
3. ·2075.
4. £80 15s. 6d.

Card 32.

1. £571 10s.
2. 4,726.
3. 10 hrs. 51 min. 24 sec.
4. $\frac{11}{14}$.

Card 33.

1. £480.
2. 16 days.
3. 4.
4. 3 miles 5 fur. 13 po. 3 yds. $10\frac{4}{5}$ in.

Card 34.

1. £4 15s.
2. 5s. $1\frac{4}{11}$d.
3. £48.
4. ·85.

Card 35.

1. £7,500.
2. £120 17s. 6d.
3. $17\frac{1}{2}$ times.
4. £37 17s. 2d.

Card 36.

1. £19 10s.
2. 5,542·4.
3. 1s. 9d.
4. £1 3s. 4d.

Card 37.

1. 81 books.
2. 5 per cent.
3. 160 children.
4. $\frac{33}{401}$.

Card 38.

1. £585.
2. ·0329 +.
3. $49\frac{3}{5}$ days.
4. ·075.

Card 39.

1. $3\frac{1}{2}$ per cent.
2. 2·625.
3. 20 days.
4. £9 3s. 4d.

Card 40.

1. 250 tons.
2. £8 15s.
3. £1,113 12s.
4. 480 steps.

...her ...o is the FIRST to point out an Error in the above Answers.